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Reports on the scientific results of the Atlantis expeditions to the West Indies, under the joint auspices of the University of Havana and Harvard University.

The Anomuran Crustacea. I. Galatheidea

BY FENNER A. CHACE, JR.

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REPORTS ON THE SCIENTIFIC RESULTS OF THE ATLANTIS EXPEDITIONS TO THE WEST INDIES, UNDER THE JOINT AUSPICES OF THE UNIVERSITY OF HAVANA AND HARVARD UNIVERSITY

The Anomuran Crustacea. I. Galatheidea (*)

(Families Chirostylidae, Galatheidae and Porcellanidae)

By Fenner A. Chace, Jr.
Museum of Comparative Zoölogy

The collections of Galatheidea obtained by "Atlantis" in the Bahamas and off the coasts of Cuba in 1938 and 1939 contains 2100 specimens, distributed among 49 species. The Chirostylidae are represented by 12 species and 146 specimens, the Galatheidae by 36 species and 1951 specimens, while the Porcellanidae comprise but three specimens of a single species. All of this material was dredged or trawled in depths ranging from 150 to over 1600 fathoms. Nine of the 49 species were previously undescribed; four of these have been published in a preliminary report[1], but all are completely described and figured below.

Included in the present report are 30 specimens belonging to six species taken by "Atlantis" in 1940 east of St. Augustine, Florida. Two of these species are not represented in the 1938 and 1939 collections from the Bahamas and off the coasts of Cuba.

Leaving out of consideration the Porcellanidae, the species of which are almost invariably littoral or sublittoral, there are now 87 species of Galatheidae known from the western Atlantic. That "Atlantis" obtained 48 of these in the Bahamas and off the north and south coasts of Cuba alone is worthy of note. As a matter of

(*) Contribution No. 322 of the Woods Hole Oceanographic Institution.

(1) Chace, 1939, Mem. Soc. Cubana Hist. Nat., vol. 13, no. 1, pp. 43-48.

record, 44 of these 48 species were found off the north coast of Cuba and only two of the four species taken in the Bahamas and two of the 14 species from the south coast of Cuba were not also taken off the north coast of Cuba. It may be noted that the percentage of western Atlantic species of Galatheidae (57.5%) obtained by "Atlantis" is comparable with the proportion of deep-water Brachyura (55%) mentioned in the report on that group(2).

In addition to reviewing the material brought back by "Atlantis", an attempt has been made to add to the usefulness of the report by including keys for the identification of all genera and all western Atlantic species. Keys to the species of the Porcellanidae have been omitted, however, since but one species was found in the "Atlantis" collections and the family is so greatly in need of a general revision that a key based on present concepts would only tend to foster errors which should be eliminated. In following out this general plan of reviewing the western Atlantic species, the "Blake" material in the Museum of Comparative Zoölogy has been of great value, and supplementary notes on specimens in that collection will be found scattered through the systematic portion of this report.

This opportunity is taken to thank those who have assisted in the preparation of this paper. Special thanks are due Dr. Waldo L. Schmitt of the U. S. National Museum for arranging loans of material and for personally examining type specimens. No less important has been the contribution of Mr. S. A. Glassell of Beverly Hills, California, toward the construction of the key to the genera of the Porcellanidae; any value which may be attached to that key is directly attributable to his counsel, supported by valuable illustrative specimens, received from time to time over the past five or six years. Finally, the invaluable advice offered by my colleagues at the Museum of Comparative Zoölogy, which is all too frequently taken for granted, is hereby gratefully acknowledged.

The greater part of the "Atlantis" collection has been incorporated with the collections of the Museum of Comparative Zoölogy, but, as far as possible, duplicate sets have been sent to the Museo Poey in Havana, Cuba, and the Museum at the Bermuda Aquarium, Flatts, Bermuda.

A complete list of stations for the two Cuban trips of "Atlantis", compiled by the author and published by the Woods Hole Oceanographic Institution, may be obtained on request.

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(2) Chace, 1940, Torreia (Havana), no. 4, p. 4.

Family CHIROSTYLIDAE

Key to the Genera of the Family Chirostylidae

1. Two pairs of supra-orbital spines; carapace crossed by transverse ciliated lines; mandibles unarmed.................... *Eumunida*
   No supra-orbital spines; carapace without transverse ciliated lines; mandibles dentate 2
2. Legs spiny and very long .... *Chirostylus*
   Legs short or of moderate length and not densely spinose..... *Urophychus*

Genus *Eumunida* Smith, 1883.

The majority of the species of this genus are confined to the Indo-pacific region; the following species is the only one so far known from the western Atlantic. Miss Gordon (Proc. Zool. Soc. Lond., (1929), pt. 4, 1930, p. 742) has given a key to the known species.

EUMUNIDA PICTA Smith

Eumunida picta S. I. Smith, 1883, Proc. U. S. Nat. Mus., vol. 6, no. 1, p. 44, pl. 2, fig. 2, pl. 3, figs. 6-10, pl. 4, figs. 1-3a. S. I. Smith, 1886, Rep. U. S. Comm. Fish. for 1885, pt. 13, no. 21, p. 650 (46). Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, pp. 308-310, text-figs. 8, 14, 35 & 36. Milne Edwards & Bouvier, 1900, Expéd. Sci. ''Travailleur'' et ''Talisman'', Crust. Déc., pt. 1, p. 364, pl. 5, fig. 1, pl. 28, fig. 26, pl. 32, figs. 20-24. Gordon, 1930, Proc. Zool. Soc. Lond. (1929) pt. 4, p. 742, text-figs. 1a., 1b, 2c, 3b & 4a. van Dam. 1933, Soboga-Exped., livr. 119, monogr. 39a[7], pp. 35, 36 & 39.

Occurrence.

North coast of Cuba:

Off Playa Baracoa, Havana Province; station 3,302; 230 fathoms; 1 small male; station 3,303; 230 fathoms; 1 male, 1 female.

Three additional specimens were taken by ''Atlantis'' in 1940 east of St. Augustine, Florida. Two females were taken at station 3,780; 30° 27′ N., 79° 52′ W.; 250-265 fathoms; February 24, 1940. A small male was taken at station 3,781; 30° 58′ N., 79° 34′ W.; 265-290 fathoms; February 24, 1940.

Remarks. – These specimens agree with Miss Gordon's description and figures. Two of the specimens, the large male from station 3,303 and the larger female from station 3,780, retain considerable of the

original color; the pattern agrees fairly well with the colored figure published by Milne Edwards and Bouvier (1900, pl. 5, fig. 1) except that the fingers of the chelae are nearly entirely chalky white, there being a sharp line of demarcation between the white and colored portions at or near the bases of the fingers.

Distribution. – These records extend the known range of *E. picta* in the western Atlantic as far south as the north coast of Cuba; it has previously been taken off New Jersey and Chesapeake Bay. In the eastern Atlantic it has been found in the region of the Canary and Cape Verde Islands and in the Pacific between New Zealand and Australia.

Genus *Chirostylus* Ortmann, 1892.

Although American authors have generally used the name *Ptychogaster* for this genus, there is little doubt that *Chirostylus* is the correct one as Miss van Dam (Siboga-Exped., livr. 119, monogr. 39a[7], 1933, p. 12) has most recently pointed out.

As was true of the preceding genus, most of the species of this genus are found in the Indo-pacific region and only two species, one of which is described below for the first time, are known from the western Atlantic. A list of the described species may be found in van Dam (1933, p. 38).

The following table may aid in distinguishing the two western Atlantic forms:

C. SPINIFER	C. AFFINIS
A large species, ovigerous females having the carapace and rostrum from 13 to more than 30 mm. long.	A relatively small species, ovigerous females having the carapace and rostrum from 8.8 to 11.3 mm. long.
Dorsal surface of carapace densely spinose and not noticeably flattened.	Dorsal surface of carapace sparsely spinose and less convex than in *C. spinifer*.
Sternum armed with at least one pair of distinct spines between the bases of the chelipeds and near the midline.	Sternum with at most a pair of tubercles in this position—generally unarmed.
Chelipeds slender and long—4.4 to 7.1 times the length of the carapace and rostrum.	Chelipeds robust and shorter—3.5 to 5.6 times the length of the carapace and rotrum.

Chirostylus spinifer (A. Milne Edwards)

Ptychogaster spinifer A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 64 (part). Milne Edwards and Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, pp. 301-303.—Milne Edward and Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 118, pl. 9, figs. 16-22, pl. 10, figs. 4-16 (part). Boone, 1927, Bull. Bingham Oceanogr. Coll., vol. 1, art. 2, p. 61. Schmitt, 1935, Sci. Surv. Porto Rico and Virgin Ids. (N. Y. Acad. Sci.), vol. 15, pt. 2, p. 181, text-fig. 43.

Chirostylus spinifer·Bouvier, 1896, Bull. Soc. entom. France, vol. 65, pp. 307-312. Doflein and Balss, 1913, Wiss. Ergebn. deutsch. Tiefsee-Exped. (Valdivia), bd. 20, lf. 3, p. 166. van Dam, 1933, Siboga-Exped., livr. 119, monogr. 39a[7], pp. 36 & 39.

Occurrence.

North coast of Cuba:

Off Playa Baracoa, Havana Province; station 3,303; 260 fathoms; 2 ovigerous females.

Off Bahía de Matanzas, Matanzas Province; station 2,999; 145-230 fathoms; 1 male; station 3,467; 215 fathoms; 1 male; station 3,479; 210 fathoms; 1 ovigerous female.

Nicholas Channel, south of Cay Sal Bank; station 2,987C; 300-315 fathoms; 1 ovigerous female; station 3,444; 320 fathoms; 1 male.

Off Caibarién, Santa Clara Province; station 3,423; 245 fathoms; 1 male, 1 ovigerous female.

Off Punta Alegre, Camagüey Province; station 2,982A; 210 fahoms; 1 male, 1 ovigerous female; station 3,408; 200 fathoms; 1 male, 1 ovigerous female; station 3,413; 215 fathoms; 2 males, 1 ovigerous female; station 3,416; 200 fathoms; 1 ovigerous female.

Off Cayo Coco, Camagüey Province; station 3,403; 210 fathoms; 1 ovigerous female.

South coast of Cuba:

Bahia de Cochinos, Santa Clara Province; station 2,960; 270 fathoms; 1 young male; station 2,961C; 190-210 fathoms; 2 males; station 2,961D; 195-235 fathoms; 1 male; station 2,962; 200-210 fathoms; 2 females (1 ovigerous); station 2,962C; 210 fathoms; 1 female; station 3,326; 265 fathoms; 3 males, 1 ovigerous female.

An additional male specimen without station data was taken in 1938.

Distribution. – *C. spinifer* is known only from the West Indian region; it has been recorded previously from the Lesser Antilles and from off the coast of Yucatán.

Chirostylus affinis, sp. nov.

(Figs. 1, 2)

Holotype. – Male, M. C. Z. No. 11294; off Caibarién, Santa Clara Province, Cuba; lat. 23° 10′ 30″ N., long. 79° 37′ W.; 265 fathoms; May 2, 1939; station 3,438.

Paratypes.

North coast of Cuba:

Off Playa Baracoa, Havana Province; station 3,303; 260 faththoms; 1 ovigerous female.

Off Bahia de Matanzas, Matanzas Province; station 3,479; 210 fathoms; 1 male; station 3,482; 190 fathoms; 1 male, 1 young.

Off Punta Alegre, Camagüey Province; station 2,980B; 220-225 fathoms; 1 male, 1 ovigerous female.

An additional ovigerous female without station data was collected in 1938.

Description. – Carapace, not including rostrum, slightly longer than broad. The dorsal surface is rather flattened, particularly posteriorly where a more or less distinct angle is formed at the junction of the dorsal and lateral surfaces. There is little demarcation of regions except for that formed by the broad, shallow cervical furrow. The most prominent spines are five or six on the midline, nine or ten along each side at the line of juncture with the lateral surfaces and a pair of prominent supraorbital spines. There are numerous smaller spines scattered over the dorsal and lateral surfaces, but not as many as are found in *C. spinifer*, and usually there are no spines arising from the posterior margin proper as in the latter species. Rostrum about one-half the length of the carapace and unarmed; it is directed forward and slightly upward and terminates beyond the eyes and slightly beyond the level of the end of the antennal peduncle.

Abdomen unarmed dorsally; but the second somite, and to a lesser degree the third as well, is more highly conical in lateral view than in *C. spinifer*.



FIG. 1

Chirostylus affinis. Holotype. × 2.

The form of the sternum is shown in the accompanying figure. There is a strong spine at the insertion of each cheliped, and nearly in the same line there may be two or three tubercles near the insertion of some long hairs at the edge of the anterior depressed area of the sternum; never is there a pair of spines at this point as in *C. spinifer* and usually even the tubercles are missing. At the insertion of the ambulatory legs there is a small spine. Otherwise the sternum is smooth and polished and entirely devoid of armature.

Basal segment of the antennular peduncle bears an outer lobe which is armed with two spines and a tuft of setae. The antennular peduncle extends but little beyond the tip of the rostrum when extended. The basal segment of the antennal peduncle is armed with a small outer tooth or spine similar to the spine at the antero-lateral angle of the carapace. Antennal scale slender and flattened dorso-ventrally; it reaches well beyond the eyes and nearly as far as the peduncle itself. The distal segment of the peduncle does not reach quite as far as the antennular peduncle and it is armed ventrally with a terminal spine.

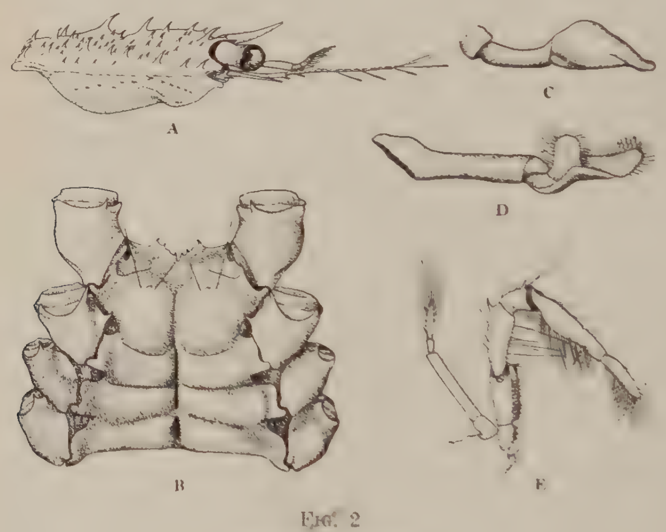


Fig. 2

Chirostylus affinis

Holotype. A. Lateral view of carapace. × 3. – B. Sternum. × 5. – C. Posterior view of first right abdominal appendage. × 10. – D. Posterior view of second right abdominal appendage. × 10. – E. Posterior view of right third maxilliped. × 5.

Third maxillipeds with a single subdistal spine on the merus and a similar one on the carpus.

Chelipeds stout and spiny. They are distinctly shorter and stouter than in *C. spinifer* when specimens of the same size and sex are compared; they range in length from three and one-half to five

and one-half times the length of the carapace and rostrum and in mature individuals they are less than five times the length of the carapace and rostrum.

Ambulatory legs with the meral joints armed with spines on both margins; the carpal joints are armed only dorsally, and this dorsal row extends to the end of the basal third of the propodus. The first pair of ambulatory legs reach to about the middle of the carpus of the chelipeds.

The abdominal appendages of the first and second somites of the male are very similar to those of *C. spinifer*.

Measurements. – Male holotype, length of carapace and rostrum 11.5, width 7.2, length of rostrum 3.5, length of chelipeds 55.0, length of first ambulatory leg 30.0 mm.; ovigerous female (station 3,303), length of carapace and rostrum 11.2, width 6.7, length of rostrum 3.6, length of chelipeds 40.0, length of first ambulatory leg 25.0 mm.

Remarks. – Two of the "Blake" specimens in the Museum of Comparative Zoölogy which were identified as *C. spinifer* by A. Milne Edwards prove to belong to *C. affinis*. They were both taken off the Barbados at stations 297 and 299 in 123 and 140 fathoms respectively. Milne Edwards and Bouvier (1897, p. 122) noted that the specimen from station 297 was not typical of *C. spinifer*.

C. affinis is apparently a smaller species than *C. spinifer;* ovigerous females have a carapace (plus rostrum) length of 8.8 to 11.3 mm., whereas thirteen ovigerous females of *C. spinifer* which I have seen give comparable measurements of 13.2 to 30.4 mm. Although the two species are very closely related, *C. affinis* can be distinguished by the fewer spines on the carapace, the more prominent dorsal hump on the second abdominal somite, the absence of one or more pairs of distinct spines near the midline of the sternum and, most noticeably, by the shorter and more robust chelipeds and ambulatory legs.

Genus *Uroptychus* Henderson, 1888.

Of the 51 described species and subspecies of this genus, 14 are known from the West Indian region. All but three of these western Atlantic forms —*U. minutus*, *U. princeps* and *U. spiniger*— are represented in the collections of the Museum of Comparative Zoölogy and this material has been used in drawing up the key given below. The literature dealing with the West Indian species is not very scattered since all of the previously known species have been described by virtually two authors, A. Milne Edwards (or A. Milne Edwards and Bouvier) and Benedict. A list of all species known before 1933

may be found in van Dam (Siboga-Exped., livr. 119, monogr. 39a[7], 1933, p. 40); two Japanese species, *U. grandirostris* Yokoya and *U. latirostris* Yokoya, have been described since publication of that report.

KEY TO THE WESTERN ATLANTIC SPECIES OF THE GENUS *UROPTYCHUS*

1. No spines on gastric region of carapace.......................... 2
   One or more spines on gastric region of carapace behind line of orbits. 9
2. Carapace, measured from posterior margins of orbits, as long as, or longer than, broad 3
   Carapace broader than long.. 5
3. Rostrum about as long as eyes..................*U. uncifer* (p. 18)
   Rostrum distinctly longer than eyes................................ 4
4. Lateral margins of carapace obscurely denticulate...*U. nitidus* (p. 11)
   Lateral margins of carapace armed with one or two large spines in addition to a series of denticles.................*U. aguayoi* (p. 21)
5. Lateral margins of carapace unarmed................................ 6
   Lateral margins of carapace dentate or spinose..................... 7
6. Rostrum triangular ....*U. jamaicensis* (p. 20)
   Rostrum subcylindrical ....*U. brevis* (p. 26)
7. Cornea much smaller than eyestalk *U. armatus* (A. Milne Edwards, 1880)
   Cornea at least as broad as eyestalk............................... 8
8. Rostrum less than twice as long as eyes....*U. minutus* Benedict, 1902.
   Rostrum about three times length of eyes..*U. spiniger* Benedict, 1902.
9. Dorsal spines of carapace confined to gastric region................. 10
   Dorsal spines of carapace not confined to gastric region............ 13
10. Carapace, measured from posterior line of orbits, longer than broad. ....*U. nitidus* (variety) (p. 14)
    Carapace broader than long 11
11. A single gastric spine in the midline...........*U. fornicatus* (p. 24)
    More than one gastric spine 12
12. Lateral spines of carapace directed forward. *U. intermedius* (A. Milne Edwards, 1880).
    Lateral spines of carapace very long and directed outward........... ....*U. spinosus* (p. 29)
13. Carapace covered with more or less uniform minute spinules.......... 14
    Lateral spines of carapace much more prominent than dorsal spines. ....*U. princeps* Benedict, 1902.
14. Carapace but little broader than long...........*U. capillatus* (p. 27)
    Carapace about a third again as broad as long......*U. rugosus* (p. 28)

Uroptychus nitidus (A. Milne Edwards)

Diptychus nitidus A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 62 (part). Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 306. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 134, pl. 11, figs. 21-22, pl. 12, figs. 10-16.

Uroptychus nitidus Henderson, 1888, Rep. Sci. Res. H. M. S. Challenger, Zoology, vol. 27 (pt. 69), p. 174, pl. 21, fig. 6. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 292. van Dam, 1933, Siboga-Exped., livr. 119, monogr. 39a7, pp. 37 & 41.

Study of about 70 specimens of this species in the Museum of Comparative Zoölogy reveals that the species is either extremely variable or that it is made up of a complex of about four species or subspecies. Although each of the three varieties described below differ more markedly from the typical form than do either *U. nitidus concolor* from the eastern Atlantic or *U. nitidus occidentalis* from the Bay of Panama, it was deemed inadvisable to separate them under specific names at the present time in the absence of any distributional data of a geographic or ecologic nature. Although Milne Edwards (1880) states that the species lives on the coral, *Chrysogorgia*, perusal of Miss Deichmann's monograph (Mem. Mus. Comp. Zoöl., Harv., vol. 53, 1936) on the alcyonarians of the "Blake" fails to reveal any definite correlation between the occurrence of *U. nitidus* and species of *Chrysogorgia* or any other alcyonarian. As will be seen from the following data, there is some slight correlation between the varieties and depth, the typical form being found in greater depths than any of the others, but there in hardly sufficient material of most of the varieties to accurately determine the bathymetric range of each. Since many of the allied species are nearly as closely related to the typical form as are these varieties, it is difficult to know where to draw the line between this and other species. *U. uncifer* has been retained as a distinct species largely because it was previously described and because it is apparently confined to shallower water than any of the other forms of the series, and *U. jamaicensis* is probably sufficiently characterized by its much broader carapace and smaller eyes to deserve being ranked as a distinct species.

TYPICAL FORM

(Fig. 3)

Occurrence.

North coast of Cuba:

Off Bahia Cárdenas, Matanzas Province; station 2,994; 565-585 fathoms; 1 male; station 2,995; 370-605 fathoms; 1 male, 2 females; station 2,996; 470-665 fathoms; 3 males, 3 ovigerous females; station 3,472; 510 fathoms; 2 males, 1 ovigerous female; station 3,474; 490 fathoms; 1 male.

Off Bahia de Santa Clara, Santa Clara Province; station 3,454; 600 fathoms; 1 ovigerous female; station 3,459; 500 fathoms; 1 male, 1 female.

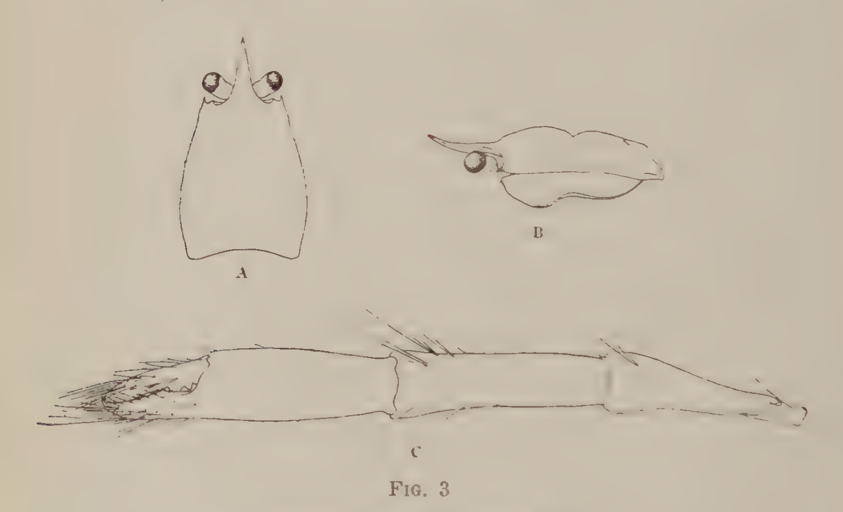


Fig. 3

Uroptychus nitidus (typical form)

Male cotype from "Blake" station 173.—A. Dorsal view of carapace. × 2.—B. Lateral view of carapace. × 2.—C. Left chelipeds from above. × 2.

Description. – A rather large form, the carapace attaining a maximum length of 13.1 mm. to base of rostrum and raging in ovigerous females from 9.5 to 13.0 mm. long. Carapace about seven-eighths as broad as long, moderately convex dorsally with a more or less distinct transverse groove in lateral view and with the lateral margins almost invariably obscurely denticulate. Rostrum narrow, distinctly longer than eyes and often twice as long, sulcate dorsally and nearly always upcurved near the tip. Cornea wider than the eyestalk and medium brown in color. Chelipeds, measured from the

ischial fracture, four and three-fourths to more than five times the length of the carapace, not including the rostrum; merus with a longitudinal furrow and a few denticles on lower surface; carpus nearly one-fourth again as long as merus, very broad and flattened dorso-ventrally, with possibly two or three denticles on lower surface and a longitudinal furrow on upper surface near inner margin; chela nearly half again as long as carpus, also broad and flattened; fingers about three-fifths as long as palm and gaping but little when closed, although one chela, usually the right, may show considerable gape at the base of the fingers in large males.

Remarks.—The typical *U. nitidus* may be readily separated from the varieties listed below by the strikingly flattened carpus of the chelipeds. The upturned rostrum, obscurely denticulate margins of the carapace, brown eyes and large size are also useful characters for distinguishing this, the commonest form of the species. *U. nitidus concolor* (Milne Edwards & Bouvier) from the eastern Atlantic is closely allied to the typical form, but in that subspecies the carpus of the chelipeds is subcylindrical rather than strongly flattened, as verified by examination of cotypes in the Museum of Comparative Zoölogy. The largest of the cotypes of *U. nitidus occidentalis* Faxon from the Bay of Panamá, an ovigerous female, is so similar to West Indian specimens that I am at a loss to discover distinguishing chararters; the three additional specimens from the same station, a male and two females, agree with Faxon's description in having the carapace broader posteriorly, the rostrum shorter and the chelipeds short, nearly as in *U. uncifer*.

Distribution.—There are specimens of the typical form in the Museum of Comparative Zoölogy which were collected by the "Blake" at the following localities:

Northwest of the Dry Tortugas, Florida; station 44; 539 fathoms.
Off Cayo Lobos, Campeche; station XVIII; 600 fathoms.
Off St. Croix; stations 130 and 131; 451-580 fathoms.
Off Guadeloupe; station 173; 734 fathoms.
Off Dominica; stations 175 and 190; 542-611 fathoms.
Off Martinique; stations 195 and 200; 472-502 fathoms.
Off St. Lucia; station 222; 422 fathoms.
Off St. Vincent; stations 227 and 232; 88-573 fathoms.

Henderson records specimens collected by the "Challenger" off Sombrero Island and off Culebra Island in 450 and 390 fathoms respectively, but the fact that all three specimens, including an ovigerous female, taken at the first locality were small, leaves some doubt

that all of the "Challenger" specimens belonged to the typical form. It will be noted from the data given above that this form is almost invariably found in depths exceeding 400 fathoms and has been taken as deep as 734 fathoms; the single exception is "Blake" station 232 at which the depth is given as 88 fathoms.

VARIETY A.

(Fig. 4)

Occurrence.

North coast of Cuba:

Off Bahia de Matanzas, Matanzas Province; station 3,469; 425 fathoms; 1 ovigerous female.

Off Bahia Cárdenas, Matanzas Province; station 3,476; 360 fathoms; 1 male, 1 female.

Off Bahía de Santa Clara, Santa Clara Province; station 3,459; 500 fathoms; 1 female.

An additional specimen of this variety, an ovigerous female, was taken by "Atlantis" in 1940 east of St. Augustine, Florida. It was found at station 3,782; 30° 10′ N., 78° 44′ W.; 435-440 fathoms; February 25, 1940.

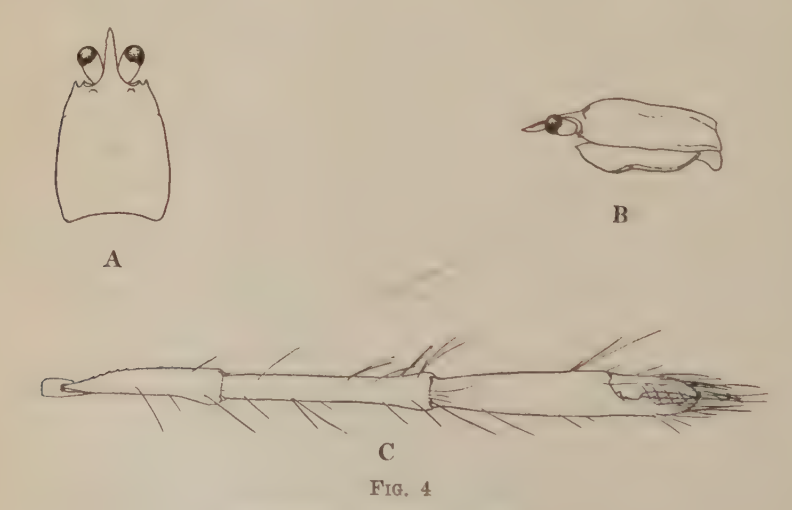


FIG. 4

Uroptychus nitidus (variety A)

Female from "Atlantis" station 3,476. – A. Dorsal view of carapace. × 3. – B. Lateral view of carapace. × 3. – C. Right cheliped from above. × 3.

Description. – A small form, the carapace attaining a maximum length of 5.7 mm. to base of rostrum and measuring 4.2 and 5.2 mm. in the two ovigerous specimens examined. Carapace about nine-tenths as broad as long, but appearing more slender due to the transverse convexity of the dorsal surface and the faint indication of any transverse groove. The lateral margins are unarmed and entire, but there is a two-pointed denticle on the dorsal surface behind the base of each eye. Rostrum narrow, up to twice as long as eyes, little sulcate dorsally and nearly straight. Cornea little wider than eyestalk and medium brown in color. Chelipeds long, about five and one-half times length of carapace and slender, although stouter in males than in females; merus subcylindrical and unarmed, or with a few tubercles; carpus one-fourth again as long as merus, cylindrical and unarmed; chela more than one-fifth again as long as carpus, narrow and slightly flattened—broader in males than in females; fingers slightly more than one-half as long as palm and meeting throughout their length in females, slightly gaping near the base in both chelae of males.

Remarks. – This form may be distinguished from the typical form and from the following varieties by the pair of denticles behind the eyes and by its small size.

Distribution. – Among the type material of *U. nitidus* from the "Blake" Expedition deposited in the Museum of Comparative Zoölogy are three males which belong to this form; two taken off Barbados at station 283 in 237 fathoms and the other found off Grenada at station 260 in 291 fathoms. The range appears to be similar to that of the typical form except for the single specimen taken east of St. Augustine. This variety has a bathymetric range of 237 to 500 fathoms, apparently only a little less deep than that for the typical form.

VARIETY B.

(Fig. 5)

Occurrence.

North coast of Cuba:

Off Bahía Cárdenas, Matanzas Province; station 3,475; 400 fathoms; 4 males, 4 females, 3 of which are ovigerous.

Nicholas Channel south of Cay Sal Bank; station 3,449; 390 fathoms; 1 ovigerous female; station 3,452; 400 fathoms; 1 male.

South end of Santaren Channel, southeast of Cay Sal Bank; station 2,985; 250 fathoms; 1 male.

Description. – A medium sized form, the carapace attaining a length of 6.9 mm. to base of rostrum and measuring 4.8 to 6.7 mm. in ovigerous females. Carapace about nine-tenths as broad as long, not very convex dorsally but with a fairly deep transverse groove in lateral view placed slightly nearer to the posterior margin than in the other varieties; lateral margins more or less denticulate. Rostrum narrow, distinctly longer than eyes up to twice as long, not noticeably sulcate dorsally and either straight or downcurved for its entire length. Cornea slightly wider than eyestalk and medium brown in color. Chelipeds measured from ischial fracture, five times or slightly more than five times as long as carapace exclusive of rostrum; they are slightly more slender in females than males but of about the same length; merus entirely smooth and devoid of denticles; carpus slightly longer than merus, subcylindrical, with a few denticles on lower surface and a very obscure longitudinal furrow on inner portion of upper surface; chela at least three-fourths as long as carpus and broad and flattened dorso-ventrally; fingers usually about one-tenth shorter than palm, never more than one-fourth shorter, and they gape noticeably in both chelae of both sexes with the exception of the ovigerous female from station 3,449 in which the fingers of the right chela meet throughout their length.

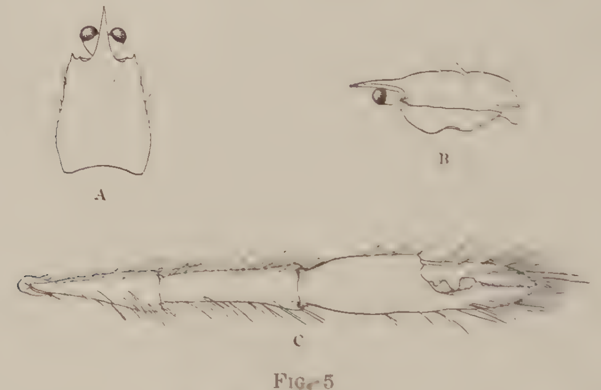


FIG. 5

Uroptychus nitidus (variety B)

Male from "Atlantis" station 3,452. – A. Dorsal view of carapace. × 2. – B. Lateral view of carapace. × 2. – C. Right cheliped from above. × 2.

Remarks. – The combination of brown eyes and proportionately long, gaping fingers usually serves to distinguish this variety at a glance. In practically all of the specimens examined, the fingers appear about as long as the palm and in several of the specimens they gape not only near the base but for nearly their entire length.

Distribution. – This variety is known only from the localities and depths given above; there are no representatives among the "Blake" material in the Museum of Comparative Zoölogy. It will be noticed that all but one specimen of the "Atlantis" series were taken in about 400 fathoms.

VARIETY C.

(Fig. 6)

Occurrence.

North coast of Cuba:

Off Bahia de Matanzas, Matanzas Province; station 2,999; 145-230 fathoms; 1 ovigerous female.

Off Caibarién, Santa Clara Province; station 3,428; 240 fathoms, 1 male, 1 ovigerous female.

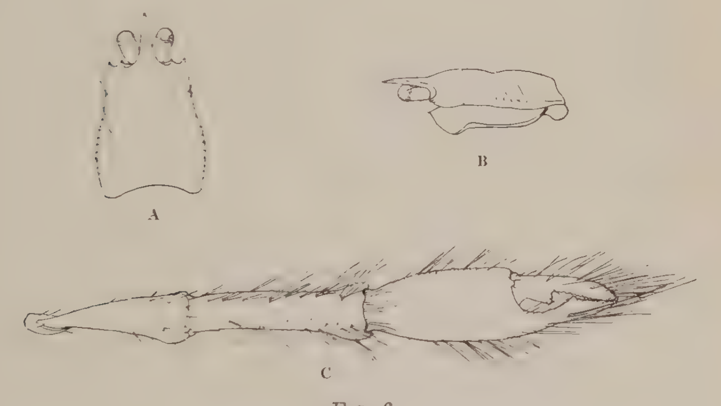


FIG. 6

Uroptychus nitidus (variety C)

Male from "Atlantis" station 3,428. – A. Dorsal view of carapace. × 2. – B. Lateral view of carapace. × 2. – C. Right cheliped from above. × 2.

Description. – Apparently a medium sized form, the male having a carapace length of 7.9 mm. to base of rostrum and the ovigerous females 7.2 and 9.8 mm. Carapace nine-tenths as broad as long, little convex dorsally with a shallow transverse groove in lateral view and with the lateral margins distinctly dentate. Rostrum narrow, considerably longer than eyes, slightly sulcate dorsally near the base, faintly downcurved in the male, slightly upturned near the tip in the females. Cornea slightly wider than eyestalk and amber-colored. Chelipeds, measured from ischial fracture, at least five times length of carapace in both sexes, but distinctly more slender in females than

in males; merus with a few granules, particularly on the lower surface; carpus between a sixth and a seventh longer than merus, with a few scattered granules, particularly on lower surface, and a faint longitudinal furrow on upper surface near inner edge; chela slightly more than half again as long as carpus, very broad and flattened dorso-ventrally and armed with sharp granules along each margin of palm; fingers two-thirds to three-fourths as long as palm and noticeably gaping near their bases, particularly in the male. The fingers of the left chela of the female from station 2,999 have no gape.

Remarks. – This variety superficially resembles the last, but it may be distinguished by the pale eyes, rougher chelipeds and shorter fingers of the chelae.

Distribution. – Known only from the localities cited above.

Uroptychus uncifer (A. Milne Edwards)

(Fig. 7)

Diptychus nitidus A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 62 (part).

Diptychus uncifer A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 63. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 306. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 140, pl. 11, figs. 1-2, pl. 12, figs. 17-29.

Uroptychus uncifer Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, pp. 292. van Dam, 1933, Siboga-Exped., livr. 119, monogr. 39a7, pp. 37 & 43.

Occurrence.

North coast of Cuba:

Off Bahia de Matanzas, Matanzas Province; station 2,999; 145-230 fathoms; 1 male, 2 ovigerous females; station 3,479; 210 fathoms; 1 ovigerous female.

Off Caibarién, Santa Clara Province; station 3,438; 265 fathoms; 2 males, 1 female (1 male with a bifid rostrum).

Old Bahama Channel off Punta Alegre, Camagüey Province; station 2,982A; 210 fathoms; 2 ovigerous females.

Remarks. – The fact that Milne Edwards included many of the "Blake" specimens of this species among the cotypes of *U. nitidus* shows how closely related the two species are. Milne Edwards separated them on the basis of the relative length of the chelipeds, but after going over the "Blake" material and the present "Atlantis" collection it is obvious that if *U. nitidus* and U. *uncifer* are distinct, they can be most easily separated by the form of the carapace and

rostrum rather than by the length of the chelipeds. The typical *U. uncifer* is a moderately small species in which the carapace reaches a length of 8.0 mm. to the base of the rostrum and ovigerous females have the carapace from 3.6 to 8.0 mm. long. The carapace is about nine-tenths as broad as long, rather flat dorsally and with the lateral margins entire except for possibly a single obscure denticle a short distance behind the anterolateral spine. The rostrum is relatively narrow and reaches just about to the tips of the eyes in all specimens examined. The cornea is amber-colored. The chelipeds are less than four times the length of the carapace in the type specimens, but they may be nearly five and a half times as long in some cases. Typically the chelipeds are very robust, similar in appearance to those of the typical form of *U. nitidus* in dorsal view but, unlike that form, the carpus is nearly cylindrical rather than strongly flattened dorsoventrally; a few specimens examined, from ''Blake'' stations 147, 241 and 254, have the chelipeds much more slender although the other characters are typical. In the male, the fingers of one or both chelae gape noticeably when closed; this is much less apparent in females, in which the fingers of one chela often meet for their entire length.

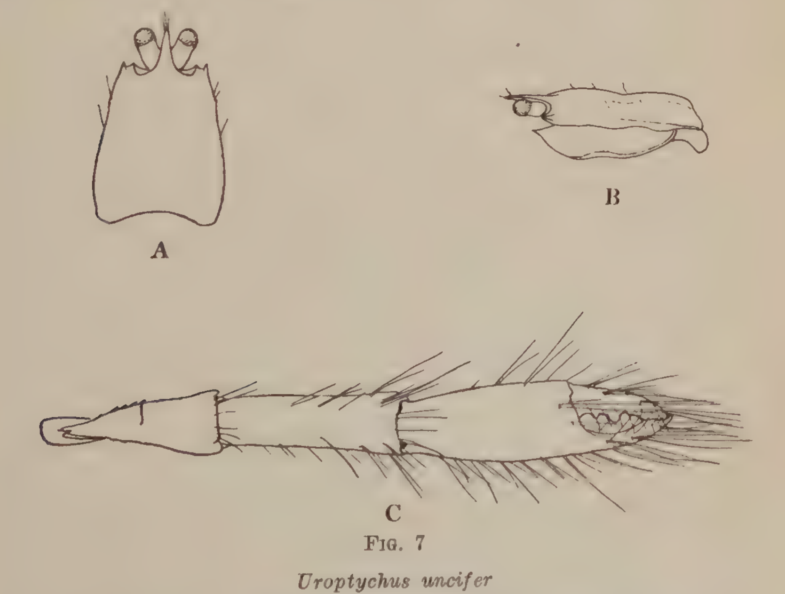


Fig. 7

Uroptychus uncifer

Male from ''Atlantis'' station 3,438. – A. Dorsal view of carapace. × 3. – B. Lateral view of carapace. × 3. – C. Right cheliped from above. × 3.

It can be seen from this summary, that *U. uncifer* is most readily diagnosed by the practically unarmed lateral margins of the carapace, the short rostrum and the amber-colored eyes. Whether or not these characters are of sufficient importance to separate the species from *U. nitidus* can best be told when more material becomes available for study.

Distribution. – A survey of the "Blake" material in the Museum of Comparative Zoölogy discloses that specimens from the following localities, some of which were originally identified as *U. nitidus* by Milne Edwards, are referable to *U. uncifer*:

Off St. Kitts; station 147; 250 fathoms.
Off St. Vincent; stations 232 & 269; 88-124 fathoms.
Off Barbados; stations 273, 277, 296, 297 & 299; 84-140 fathoms.
Off Grenadines; station 241; 163 fathoms.
Off Grenada; station 254; 164 fathoms.

These records, together with those from the "Atlantis" Expedition, are the only ones known for this species. It will be noted that this is a relatively shallow water form, found in depths of from 84 to 265 fathoms.

Uroptychus jamaicensis Benedict
(Fig. 8)

Uroptychus jamaicensis Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 294, text-fig. 38.

Occurrence.

North coast of Cuba:

Off Bahia Cárdenas, Matanzas Province; station 2,995; 370-605 fathoms; 3 males, 4 females, one of which is ovigerous.

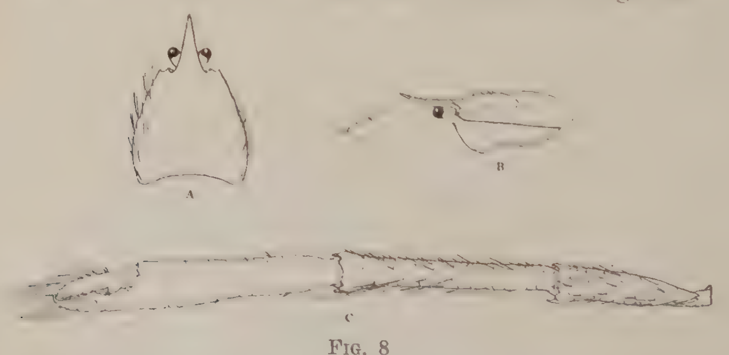


Fig. 8
Uroptychus jamaicensis
Male from "Atlantis" station 2,995. – A. Dorsal view of carapace. × 1½. – B. Lateral view of carapace. × 1½. – C. Left cheliped from above. × 1½.

Remarks. – This is a medium sized species in which the carapace attains a length of 9.0 mm. to base of rostrum and the single ovigerous female in the collection has a carapace length of 8.0 mm. It differs from the various varieties of *U. nitidus*, to which it is closely allied, by the distinctly broader carapace which is always obviously broader than long, the relatively small black eyes, long chelipeds, which are about six and a half times as long as the carapace and the short fingers of the chelae which are less than half the length of the palm; also the propodi of the ambulatory legs lack the series of five to nine long spines found on the lower margin of that joint in *U. nitidus.*

Distribution. – Previously known only from the type locality in the Caribbean Sea west of Dominica in 683 fathoms.

UROPTYCHUS AGUAYOI Chace

(Figs. 9, 10)

Uroptychus aguayoi Chace, 1939, Mem. Soc. Cubana Hist. Nat., vol. 13, no. 1, p. 43.

Occurrence.

Bahamas:

Western part of Northwest Providence Channel; station 2,950; 285 fathoms; 1 ovigerous female holotype.

Description. – Carapace, not including rostrum as long as broad at posterior third; smooth and unarmed dorsally. It is armed laterally with a large spine at the anterolateral angle; this is followed by a denticle and, between the anterior and posterior branches of the cervical groove, a very large spine with one or two denticles on its posterior slope; behind the posterior branch of the cervical groove is a medium sized spine followed by five or six denticles. The posterior fourth of the lateral margin is smoothly carinate with a submarginal gutter extending around the posterolateral angle. Rostrum about two-thirds as long as the carapace, about twice as long as broad at base, more than twice as long as the eyestalk, slightly convex laterally and deeply concave dorsally.

Abdomen smooth and glabrous. Telson deeply incised laterally at about the end of the basal third of its length; the terminal portion is strongly concave distally and distinctly narrower than the proximal portion.

Thoracic sternum armed with a pair of large spines at the insertion of the chelipeds. The four series of transverse ridges are provided with numerous very fine hairs and there are similar hairs on the extreme lateral portions of the two posterior sternal segments.

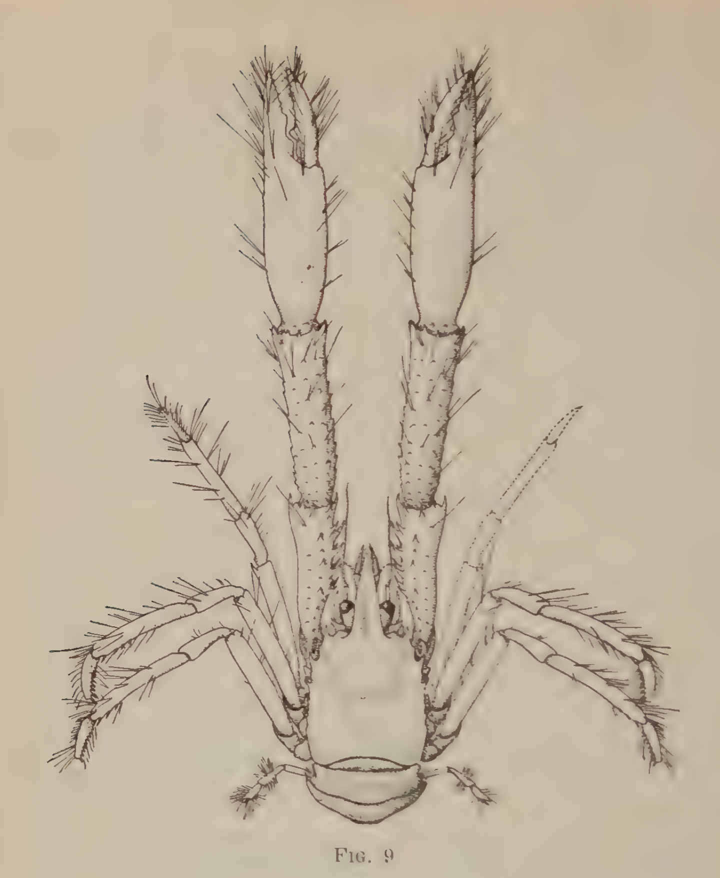


Fig. 9

Uroptychus aguayoi. Holotype. × 2.

Antennular peduncle falls far short of the end of the rostrum even when fully extended; its basal segment is armed with a prominent outer spine. Antennal peduncle extends slightly beyond the penultimate segment of the antennular peduncle; its basal segment has a spine at the outer angle; the antennal scale falls a little short of the end of the peduncle.

Third maxillipeds unarmed except for two or three small spines on the distal margin of the posterior surface of the coxa and the usual pectinate inner margin of the ischium.

Chelipeds five times as long as the carapace, not including the rostrum. Merus about three-fourths as long as carpus which, in turn, is two-thirds as long as chela. Ischium armed with a long spine at both the upper and lower articulations with the merus and a few additional tubercles on the inner surface. Merus with 14 to 16 long spines arranged roughly in three longitudinal rows on the inner and

upper surfaces, as well as six similar spines at the carpal articulation. Carpus covered with numerous low denticles and armed with six spines at the distal articulation. Chela wholly unarmed except for the dentition of the inner edges of the fingers.

Ambulatory legs with one or two dorsal spines on the ischium, about four low dorsal denticles on the proximal half of the merus and a spine at the distal end of the lower margin of that segment. There are two to four small movable spines near the distal end of the lower margin of the propodus. Dactyls with about nine ventral teeth which increase in size distally; in the single specimen, the tips of all of the dactyls are broken off.

Measurements. – Length of carapace and rostrum 13.3 mm.; breadth of carapace 7.9 mm.; length of rostrum 5.5 mm.; length of eyestalk 2.0 mm.; length of chelipeds 40.0 mm.

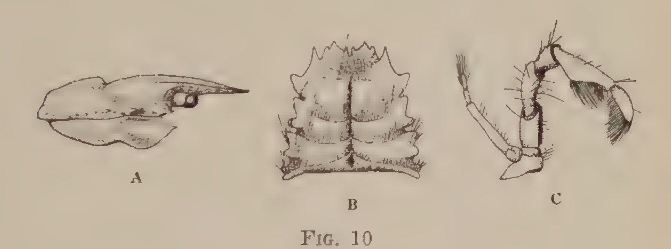


FIG. 10

Uroptychus aguayoi

Holotype. – A. Lateral view of carapace. × 2. – B. Sternum. × 3. – C. Posterior view of right third maxilliped. × 3.

Remarks. – Of the western Atlantic species, *U. aguayoi* is most nearly allied to *U. armatus* (A. Milne Edwards) and *U. spiniger* Benedict. From *U. armatus* it may be distinguished by the much longer and broader rostrum and by the pair of spines on the sternum at the bases of the chelipeds; from *U. spiniger* it differs in having a broader rostrum, much more spiny chelipeds and no spines on the meral and carpal joints of the third maxillipeds. From *U. bellus* Faxon, an eastern Pacific species, it is distinguished by the broader rostrum and absence of spines on the chelae and ambulatory legs. It is rather closely allied to *U. bouvieri* Caullery from the eastern Atlantic, but that species has more spines on the propodi of the ambulatory legs and the spines on the carpus of the chelipeds are stronger. *U. naso* van Dam, from the Malay Archipelago, has the rostrum toothed, the meri of the ambulatory legs coarsely serrate and the chelae spinulous. From all other known species, *U. aguayoi* may be separated by the spinose lateral margins of the carapace

and chelipeds, the absence of gastric spines and the reduction of the spines on the propodi of the ambulatory legs.

Distribution. – Known only from the type locality.

Uroptychus fornicatus, sp. nov.

Figs. 11, 12)

Holotype. – Ovigerous female, M. C. Z. No. 11302; Bahia de Cochinos, Santa Clara Province, Cuba; lat. 22° 09′ N., long. 81° 09′ W.; 300 fathoms; April 4, 1939; station 3,325.

Description. – Carapace, not including rostrum, distinctly broader than long. Dorsal surface very convex in all directions and without a trace of regional demarcations. It is armed with a single inconspicuous gastric spine on the midline at the base of the rostrum and a series of seven lateral spines on each margin; this series is made up of a small spine at the anterolateral angle, a minute spine behind this just inside the lateral margin and five additional prominent spines. Rostrum distinctly broader than long, triangular, with slightly sinuous margins and rather deeply concave dorsally; the rostrum reaches about to the tips of the eyes when they are turned forward.

Abdomen smooth and glabrous. Telson incised laterally at about the end of the basal third of its length; the terminal portion is but slightly narrowed than the proximal and concave on its distal margin.

Thoracic sternum armed with a prominent spine followed by three or four denticles at the insertion of each cheliped. There is a pair of sharp ridges between the chelipeds, but otherwise the sternum is free from sculpture.

Antennular peduncle extends beyond the tip of the rostrum by about two-thirds the length of its terminal segment; its basal segment is armed ventrally with a strong outer spine. Antennal peduncle does not reach quite to the level of the tip of the rostrum; its basal segment is armed with a minute outer tooth and its terminal joint with an inner spine at the tip; the scale is rather broad at the base and tapers to a sharp point that does not quite attain the level of the end of the peduncle.

Third maxillipeds armed with a large spine on the coxa, two spines on the posterior surface and one at the outer distal angle of the merus and a minute spine on the outer surface and a larger one at the distal angle of the carpus.

Chelipeds four times as long as the carapace, not including the rostrum. The coxa is armed with an inner and a stronger spine on the outer margin. Ischium with a large spine on the upper surface at the articulation with the merus and a second on the ventral side, also at the articulation. Merus armed with about 12 well developed spines arranged in five longitudinal rows and two distal spines on either side of the carpal articulation. Carpus very slightly longer

than merus, also armed with about a dozen spines arranged in longitudinal rows and four spines on the distal margin. Chela half again as long as carpus, slightly compressed dorsally and armed along the margins with a row of serrations; in the unique example, the right chela is somewhat more robust than the left.



FIG. 11

Uroptychus fornicatus. Holotype. × 6.

Meral and carpal joints of the ambulatory legs armed with prominent spines on the margins, the spines being fewer and less prominent on the posterior legs than on the anterior ones. Propodi armed with three to five movable spines on the ventral margins. Dactyls devoid of teeth on the margins, but bifid terminally.

Measurements. – Length of carapace and rostrum 4.9 mm.; breadth of carapace 4.1 mm.; length of rostrum 1.2 mm.; length of chelipeds 14.5 mm.

Remarks. – This is one of the smaller species of the genus. It does not appear to be closely related to any of the described species and can easily be distinguished by the smooth, vaulted and laterally armed carapace; the short, borad and dorsally concave rostrum; and the armature of the chelipeds and ambulatory legs. Possibly it is nearest to *U. minutus* Benedict from off Trinidad, but it can be readily separated from that species by the form of the rostrum and chelae. Of the extra-American forms, *U. fornicatus* resembles *U. curvirostris* Alcock and Anderson from the Indian Ocean: the latter species, however, has the meral and carpal joints of the chelipeds largely smooth and the carapace narrower.

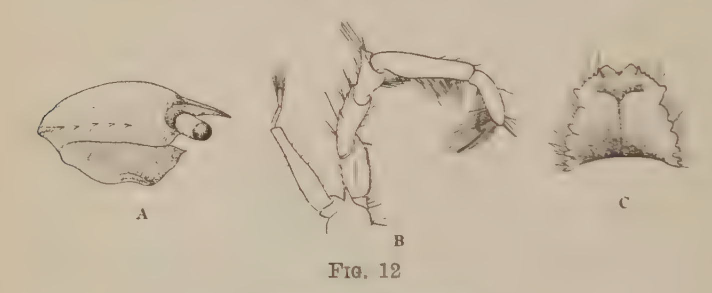


FIG. 12

Uroptychus fornicatus

Holotype. – A. Lateral view of carapace. × 5. – B. Posterior view of right third maxilliped. × 10. – C. Sternum. × 5.

Distribution. – Known only from the type locality. This is apparently a rare species, at least in the Cuban region, as but a single specimen was taken in Bahia de Cochinos despite the large number of hauls made there.

UROPTYCHUS BREVIS Benedict
(Fig. 13)

Uroptychus brevis Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 292, text-fig. 35.

Occurrence.

North coast of Cuba:

Off Bahia Cárdenas, Matanzas Province; station 2,995; 370-605 fathoms; 1 ovigerous female; station 3,475; 400 fathoms; 1 male.

Four additional specimens, three males and a female with two abdominal parasites, were taken by "Atlantis" in 1940 east of St. Augustine, Florida. They were found at station 3,780; 30° 27′ N., 79° 52′ W.; 250-265 fathoms; February 24, 1940.

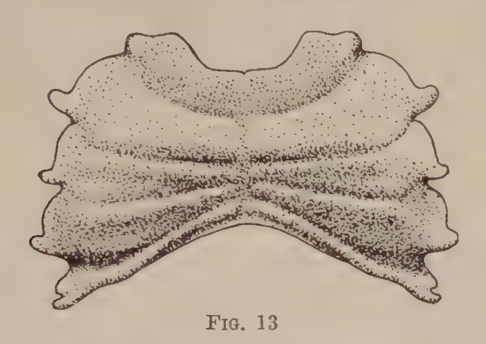


FIG. 13

Uroptychus brevis

Sternum of male from "Atlantis" station 3,475.

Remarks. – There is no difficulty in recognizing this species from Benedict's description and figure. The sternum is very broad and unarmed, and the transverse ridges are somewhat more prominent than in other species examined.

Distribution. – *U. brevis* has been previously recorded only from the type locality off the north coast of Pinar del Río Province, Cuba, near Punta Tabaco (not off Yucatán as recorded by Benedict).

UROPTYCHUS CAPILLATUS Benedict

Uroptychus capillatus Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 293, text-fig. 36.

Occurrence.

North coast of Cuba:

Off Caibarién, Santa Clara Province; station 3,438; 265 fathoms; 1 ovigerous female.

Remarks. – The entire body and appendages are covered with minute spinules interspersed with hairs in this species. The "Atlantis" specimen is about the same size as Benedict's type, but the rostrum is proportionately shorter, being shorter than the carapace. Unfortunately, this specimen, like the type, lacks both chelipeds.

Distribution. – *U. capillatus* has been previously recorded only from the type locality near Arrowsmith Bank off the east coast of Yucatán.

Uroptychus rugosus (A. Milne Edwards)

Diptychus rugosus A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 63 (part). Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 306. Milne Edwards & Bouvier, 1897, Mem. Comp. Zoöl. Harv., vol. 19, no. 2, p. 124, pl. 11, figs. 4-14.

Uroptychus rugosus Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 292. Boone, 1927, Bull. Bingham Oceanogr. Coll., vol. 1, art. 2, p. 62. van Dam, 1933, Siboga-Exped., livr. 119, monogr. 39a[7], pp. 37 & 43.

Occurrence.

North coast of Cuba:

Off Playa Baracoa, Havana Province: station 3,303; 260 fathoms; 1 ovigerous female.

Remarks. – A male specimen taken at "Blake" station 299 and identified as *U. rugosus* by A. Milne Edwards is not this species at all, as the spines on the carapace are much less numerous and larger: it probably represents an undescribed species allied to *U. intermedius*. Therefore, this station must be eliminated from the list of localities at which *U. rugosus* has been found. However, there is in the collection of the Museum of Comparative Zoölogy an ovigerous female specimen of this species taken at "Blake" station 232 and identified by A. Milne Edwards but never recorded. Miss Boone notes that the specimens taken by the "Pawnee I" near English Cay were living commensally with a crinoid (probably *Stylometra spinifera* which was found at the same station). Dr. H. L. Clark informs me that station 3,303 was one of four at which this species of crinoid was collected by "Atlantis". It was also taken at three of the five "Blake" stations at which *U. rugosus* was found. Whether or not this crustacean is commensal with this one species of echinoderms can be determined only by additional records.

Distribution. – *U. rugosus* has been taken previously off Dominica, St. Vincent and the Grenadines in the Lesser Antilles and off "English Cay", which is apparently off the coast of British Honduras north of Glover Reef. The previously recorded depths show a bathymetric range of from 95 to 190 fathoms, somewhat shallower than the depth in which the "Atlantis" specimen was taken.

Uroptychus spinosus (A. Milne Edwards & Bouvier)

Diptychus spinosus Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 306. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 129, pl. 11, figs. 15-20.

Uroptychus spinosus Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 292. van Dam, 1933, Siboga-Exped., livr. 119, monogr. 39a[7], pp. 37 & 43.

Occurrence.

North coast of Cuba:

Off Bahia de Matanzas, Matanzas Province; station 2,999; 145-230 fathoms; 5 males, 6 ovigerous females.

A lot of 10 additional specimens, seven males and three ovigerous females, was taken by "Atlantis" in 1938, presumably from off the north coast of Cuba, but unfortunately the station label for this lot is missing.

Remarks. – There is little danger of confusing this with any other of the West Indian species. It is a medium sized species, attaining a carapace length of 9.9 mm. to the base of the rostrum, ovigerous females having the carapace from 6.9 to 7.8 mm. long. Milne Edwards and Bouvier failed to point out, either in their description or figure, that there are from two to five distinct denticles behind each eye on the dorsal surface of the carapace; in Benedict's key however, the species is correctly placed among those having gastric spines.

Distribution. – The above locality is the first positive record for the species, the holotype probably having been taken somewhere off the coast of Cuba.

Family GALATHEIDAE

Only three of the six genera of Galatheidae have so far been recorded from the western Atlantic. Of the remaining three, *Pleuroncodes* is represented by two species in the eastern Pacific; *Cervimunida* by two species, one from Japanese waters and the other from the eastern Pacific; and *Bathymunida* by five species, all found in the Indo-pacific region.

KEY TO THE GENERA OF THE FAMILY GALATHEIDAE

1. Integument pliable, not strongly calcified; well developed transverse ciliated lines on carapace; exopod of first maxillipeds with a simple lash (Galatheinae) 2

   Integument hard, well calcified; transverse ciliated lines on carapace feeble or absent; exopod of first maxillipeds without a lash (Munidopsinae) .... *Munidopsis* (p. 69)

2. Rostrum triangular and flattened or concave above...*Galathea* (p. 30)
   Rostrum not triangular 3
3. Rostrum a long, slender spine.............................. 4
   Rostrum not a long, slender spine.......................... 5
4. Side walls of carapace not visible in dorsal view......*Munida* (p. 31)
   Side walls of carapace partially visible in dorsal view...............
   ....*Pleuroncodes* Stimpson, 1860.
5. Rostrum compressed, dentate and arched to permit free movement of eyes; no large dorsal spines on carapace..*Cervimunida* Benedict, 1902.
   Rostrum a broad, three-spined plate; two large dorsal spines on carapace ....*Bathymunida* Balss, 1914.

Genus *Galathea* J. Fabricius, 1793.

The great majority of the species of *Galathea* now known, 39 out of 52 species, are found in the Indo-pacific region; eight have been recorded from the eastern Atlantic, three from the eastern Pacific and but two from the western Atlantic. Most of the known species of the genus —about 30 species—are littoral forms, and only 11 have been found in depths exceeding 100 fathoms. Although at least one littoral is known from each of the first three regions mentioned above, none have so far been taken in the western Atlantic.

The following table gives the important distinglishing characters of the two West Indian forms:

G. rostrata	G. agassizii
Rostrum armed with four pairs of large teeth.	Rostrum minutely and obscurely denticulate.
Transverse striae on carapace very prominent and at least four are continuous for entire breadth of carapace.	Transverse striae not prominent; one or two are uninterrupted for entire breadth of carapace.
Inner margin of merus of third maxillipeds armed with three or four spines.	Merus of third maxillipeds armed with a single long spine with possibly an additional denticle.

Galathea agassizii A. Milne Edwards

Galathea Agassizii A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 47. Doflein & Balss, 1913, Wiss. Ergebn. deutsch. Tiefsee-Exped. (Valdivia), bd. 20, lf. 3, p. 169.

Galathea agassizi Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7 vol. 16, pp. 252, 253 & 324. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, pp. 247 & 300.

Galathea Agassizi Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, 1897, p. 17, pl. 1, figs. 6-15. Milne Edwards & Bouvier, 1900, Expéd. Sci. ''Travailleur'' et ''Talisman'', Crust. Déc., pt. 1, p. 282, pl. 6, fig. 7. Bouvier, 1922, Rés. Camp. sci. Monaco, fasc. 62, p. 43.

Occurrence.

North coast of Cuba:

Off Bahia Cárdenas, Matanzas Province; station 3,474; 490 fathoms; 1 male.

Eleven additional specimens, eight males and three females, were taken by ''Atlantis'' in 1940 east of St. Augustine, Florida, at station 3,781; 30° 58′ N., 79° 34′ W.; 265-290 fathoms; February 24, 1940.

Distribution.—*G. agassizii* has been previously taken in the Lesser Antilles off St. Lucia, St. Vincent and Barbados in 166 to 237 fathoms and in the eastern Atlantic in the vicinity of the Cape Verde and Canary Islands and off the northwest coast of Africa in 82 to 898 fathoms.

Genus *Munida* Leach, 1820.

Of approximately 82 species of Munida now known, 30 have been taken in the western Atlantic, thereby giving the genus a better comparative representation in this region than have any of the genera considered above. Due to the expeditions of the ''Hassler'' and ''Blake'', and now of ''Atlantis'', 22 of these western Atlantic species have been available for study in the collections of the Museum of Comparative Zoölogy. Through the kindness of Dr. Waldo L. Schmitt and the Secretary of the Smithsonian Institution, I have been able to examine certain material from that museum, including type material of three species not represented in the M. C. Z. collections. Therefore, only five species, *M. beanii*, *M. elfina*, *M. spinifrons* and *M. spinosa*, have not been available for study in drawing up the following key; it is not unlikely that further examination will show some of these five to be synonymous with previously described species, but they have been tentatively incorporated in the key on the basis of minor differences noted in the descriptions. Complete lists of species known up to the time of publication are to be found in Benedict (Proc. U. S. Nat. Mus., vol. 26, no. 1311, 1902, p. 305) and in Doflein and Balss (Wiss. Ergebn. deutsch. Tiefsee-Exped. (Valdivia), Bd. 20, Lf. 3, 1913, p. 172). Since publication of the latter

list, only two species not included in the following key have been described: *M. brevirostris* Yokoya, 1933, from off Japan, and *M. sarsi* Brinkmann, 1936, a new name for *M. rugosa* Sars nec Fabricius.

KEY TO THE WESTERN ATLANTIC SPECIES OF THE GENUS *MUNIDA*

1. Posterior margin of carapace unarmed; no median spines on cardiac region 2
   Ridge along posterior margin of carapace armed with spines; one or more median spines on cardiac region 23
2. Rostral spines armed laterally with distinct spinules .... *M. spinifrons* Henderson, 1885.
   Rostral spine not distinctly spinose on the margins 3
3. On basal segment of antennular peduncle, the spine outside of base of following segment is the longer 4
   Inner terminal spine on basal antennular segment nearly or quite twice as long as outer one 12
4. Spines of carapace and chelipeds very strongly developed .... *M. spinosa* Henderson, 1885.
   Armament of spines not abnormally strong 5
5. Eyes distinctly wider than eyestalks 6
   Eyes not wider than the eyestalks 11
6. Intermediate spines present between large gastric pair which are situated directly behind supraoculars 7
   No intermediate spines between large gastric pair 9
7. Second, third and fourth abdominal somites armed with spines .... *M. constricta* (p. 34)
   Fourth abdominal somite unarmed 8
8. No spines on dorsal surface of triangular area of carapace behind anterior branch of cervical groove .... *M. miles* (p. 36)
   One or two spines on each triangular area between branches of cervical groove, and a widely separated pair behind posterior branch of cervical groove, one on either side of cardiac region... *M. sancti-pauli* (p. 38)
9. Supraocular spines extend beyond eyes; second and third abdominal somites armed with spines .... *M. valida* Smith, 1883.
   Supraocular spines do not reach as far as eyes; third abdominal somite unarmed 10
10. Chelipeds, measured from ischial fracture, between three and four times as long as carapace to base of rostral spine; a moderately large species .... *M. forceps* (p. 39)
    Chelipeds less than two and one-half times as long as carapace; a small species .... *M. nuda* (p. 40)
11. Second abdominal somite armed with spines; following somites decorated with at least one transverse groove on each .... *M. microphthalma* (p. 40)
    No spines on any abdominal somites; fourth and following somites smooth, without transverse grooves or ridges... *M. subcaeca* (p. 43)

12. A second pair of small spines directly behind large gastric pair in line with supraocular spines; four small spines in midline behind rostrum........................*M. robusta* A. Milne Edwards, 1880.
 No pair of small spines directly behind large gastric pair; never more than one or two spines on midline of gastric region............... 13
13. Second, third and fourth abdominal somites armed with spines; chelipeds rather robust, measured from ischial fracture they are less than three times length of carapace to base of rostral spine........ 14
 Fourth abdominal somite unarmed; chelipeds slender, more than three times length of carapace.. 15
14. Merus of third maxilliped with a strong, curved spine at outer distal angle and u ually a small spine on inner margin.................. ....*M. subrugosa* Dana, 1852.
 Merus of third maxilliped unarmed ....*M. gregaria* (Fabricius, 1793).
15. Second and third abdominal somites armed with spinules............ ....*M. media* Benedict, 1902.
 Third abdominal somites unarmed.................................. 16
16. Usually two or more spines on ridge behind cervical groove........... 17
 No spines on ridge behind cervical groove........................ 21
17. Second abdominal somite armed with spinules...................... 18
 Abdominal somites unarmed.. 19
18. Supraocular spines reaching to or beyond cornea; a medium-sized to large species......................*M. iris* A. Milne Edwards, 1880.
 Supraocular spines not reaching to cornea; a very small species...... ....*M. pusilla* Benedict, 1902.
19. Spine at anterolateral angle of carapace followed by six smaller lateral spines; chelae and fingers subcylindrical......................... 20
 Spine at anterolateral angle of carapace followed by seven or eight spinules; chelae and fingers flattened...........*M. sculpta* (p. 44)
20. Two to four spines on ridge behind cervical groove...*M. irrasa* (p. 46)
 Eight spines on ridge behind cervical groove...*M. elfina* Boone, 1927.[1]
21. Second abdominal somite usually armed with a few spinules......... ....*M. angulata* Benedict, 1902.
 Abdominal somites unarmed.. 22
22. Spine at anterolateral angle of carapace long, followed by six small lateral spines ....*M. simplex* Benedict, 1902.
 Anterolateral spine not very long, followed by seven smaller spines ....*M. beanii* Verrill, 1908.[2]
23. Rostral spine slightly shorter than supraocular spines. *M. longipes* (p. 47)
 Rostral spine distinctly longer than supraoculars.................. 24
24. Basal segment of antennular peduncle armed at outer distal angle with two spines or a bifid spine, one placed above the other; carapace broad, depressed and very spinulose..........*M. schroederi* (p. 50)
 Basal segment of antennular peduncle armed at outer distal angle with a single spine.. 25

(1) It is extremely difficult from Miss Boone's description and figure to distinguish this species from *M. irrasa*.

(2) Although Verrill compares this species with *M. simplex*, it may prove to be even more closely related to *M. angulata*.

25. Transverse striae of carapace armed with many small spinules; posterior margin of carapace armed with six to fifteen spines; basal joint of antennular peduncle with from three to five lateral spines in addition to terminal pair; thoracic sternum with a small marginal spine at insertion of each appendage................***M. affinis*** (p. 55)
Transverse striae of carapace at most tuberculate or beaded; posterior margin of carapace armed with two to six spines; basal segment of antennular peduncle with one or two lateral spines in addition to terminal pair; thoracic sternum unarmed........................... 26
26. A strong median spine on posterior portion of fourth abdominal somite 27
No distinct median spine, rarely a minute denticle, on posterior part of fourth abdominal somite................................... 29
27. Supraocular spines barely reaching cornea.........***M. flinti*** (p. 57)
Supraocular spines reaching to distal margin of cornea or beyond..... 28
28. Transverse striae on carapace very numerous, discontinuous and obscure ....***M. stimpsoni*** (p. 57)
Transverse striae on carapace relatively few in number, not noticeably interrupted and very distinct to the naked eye....***M. striata*** (p. 61)
29. One or more spines in midline on gastric region..*M. evermanni* (p. 64)
No median spines on gastric region............***M. benedicti*** (p. 66)

Munida constricta A. Milne Edwards

(Fig. 14)

Munida constricta A. Milne Edwards, 1880, Bull. Mus. Comp. Zool. Harv., vol. 8, no. 1, p. 52. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 256. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 40, pl. 3, fig. 5. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 252.

Occurrence.

North coast of Cuba:

Nicholas Channel south of Cay Sal Bank; station 3,450; 390 fathoms; 1 female.

Remarks. – This is a medium-sized species, the largest male examined having a carapace length to base of rostral spine of 11.3 mm. and the largest female —the only ovigerous specimen seen— 14.0 mm. The species is characterized by a row of three of four pairs of spines across the gastric region, one on each hepatic region in adults and sometimes a spine on the ridge behind the cervical groove on either side of the cardiac region; six lateral spines behind the spine at the anterolateral angle; posterior margin of carapace unarmed; second abdominal somite armed with a row of from four to eight spines anteriorly, the third somite with four to six spines and the fourth somite with two; basal antennular segment armed with two

terminal spines, the outer longer than the inner, a long, upwardly directed lateral spine and a much smaller lateral spine, behind which are a few denticles; third maxillipeds with an anterointernal spine on the ischium and two spines with one of two denticles between them on the inner margin of the merus; the sternum is unarmed; the chelipeds, measured from the ischial fracture, are from two to two and one-half times the length of the carapace exclusive of the rostrum; the fingers of the chelae are longer than the palm and are armed with one or more spines on their outer margins.

For a comparison of this species and *M. miles*, see the remarks under that species.

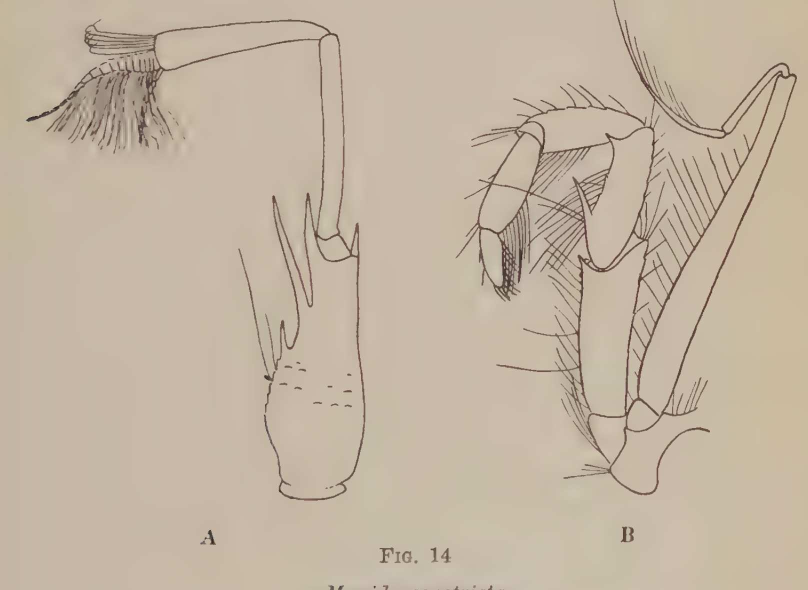


Fig. 14

Munida constricta

Male cotype from "Blake" station 221. – A. Right antennule from below. × 10. – B. Third maxilliped. × 10.

There is a female of this species in the Museum of Comparative Zoölogy taken by the "Blake" off St. Vincent at station 230 in 464 fathoms; this specimen is not mentioned by Milne Edwards and Bouvier and was apparently never seen by them. Two lots of the type series, however, from off St. Kitts, stations 146 and 147, should be referred to *M. miles* if both species are recognized.

Distribution. – *M. constricta* is known from off the north coast of Cuba and from several localities scattered throughout the Lesser An-

tilles in depths ranging from 154 to 464 fathoms; it is apparently much more abundant in the southern than the northern part of the West Indian region.

MUNIDA MILES A. Milne Edwards

Munida miles A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 51. (?) Henderson, 1888, Rep. Sci. Res. H. M. S. Challenger, Zooloy, vol. 27 (pt. 69), p. 126. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 256. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 35, pl. 3, figs. 1-4. Boone, 1927, Bull. Bingham Oceanogr. Coll., vol. 1, art. 2, p. 50.

Munida decora Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 257, text-fig. 8.

Occurrence.

North coast of Cuba:

Off Playa Baracoa, Havana Province; station 3,303; 260 fathoms; 1 male.

Off Havana, Havana Province; station 3,003; 240-300 fathoms; 1 male, 2 females, 1 of which is soft-shelled.

Off Bahia Cárdenas, Matanzas Province; station 3,476; 360 fathoms; 1 male.

Nicholas Channel, south of Cay Sal Bank; station 2,987; 280-300 fathoms; 3 males; station 2,987A; 285-300 fathoms; 8 males, 8 females, 7 of which are ovigerous; station 2,987C; 300-315 fathoms; 2 males, 1 female with a branchial parasite; station 3,443; 325 fathoms; 5 males, 3 females, 2 of which are ovigerous; station 3,444; 320 fathoms; 5 males, 2 ovigerous females; station 3,445; 330 fathoms; 2 males, 5 ovigerous females (1 male with a branchial parasite); station 3,446; 360 fathoms; 6 males, 2 females, 1 of which is ovigerous.

Off Caibarién, Santa Clara Province; station 3,432; 250 fathoms; 3 males, 3 ovigerous females; station 3,434; 260 fathoms; 14 males, 10 females, 7 of which are ovigerous and 1 has a branchial parasite; station 3,435; 255 fathoms; 3 males, 4 females, 3 of which are ovigerous; station 3,436; 255 fathoms; 1 ovigerous female; station 3,437; 260 fathoms; 3 males, 13 females, 10 of which are ovigerous; station 3,438; 265 fathoms; 7 males, 12 females, 9 of which are ovigerous.

South coast of Cuba:

Bahia de Corrientes, Pinar del Río Province; station 3,315; 350 fathoms; 1 ovigerous female.

Bahia de Cochinos, Santa Clara Province; station 2,963D; 220-275 fathoms; 6 males, 1 ovigerous female; station 2,963E; 220-235 fathoms; 3 males, 3 ovigerous females; station 3,324; 320 fathoms; 1 young; station 3,328; 260-275 fathoms; 3 males, 2 ovigerous females.

Remarks.—*M. miles* is a medium-sized species, the largest male examined having a carapace length to base of rostral spine of 19.1 mm. and the largest female 20.0 mm.; the smallest ovigerous female has the carapace 6.0 mm. long. The species is extremely closely related to *M. constricta*, the basal antennular segment and the third maxilliped being practically identical in the two species. The available material indicates, however, that *M. miles* has the carapace somewhat broader, the chelipeds more robust and there is always a pair of spines on the fourth abdominal somite in *M. constricta* which is invariably absent in *M. miles.*

There is little doubt that *M. decora* is synonymous with this species, for Benedict's description and figure are perfectly applicable to the "Blake" type specimens of *M. miles.* On the other hand, Benedict has pointed out that *M. valida* is not a synonym of *M. miles* as Henderson believed. The "Challenger" specimens from off Pernambuco which Henderson assigned to *M. miles* must be open to question until re-examined, due to the differences between them and the "Blake" material which Henderson considered insignificant.

Three lots of specimens which were determined as *M. miles* by A. Milne Edwards, the male and female cotypes from "Blake" station 11, an ovigerous female from station 45 and a female from station 232, should be referred to *M. nuda*, a much smaller species than *M. miles.*

In addition to the type series of *M. miles* noted by Milne Edwards and Bouvier, the species was taken by the "Blake" at the following localities: Gulf of Mexico, station 45; off Havana, Cuba, station 53; off St. Croix, station 129; off St. Kitts, stations 146, 147, and 148; off Montserrat, stations 153 and 154; off Martinique, station 209; off St. Lucia, stations 215 and 218; off St. Vicent, station 232; off Barbados, station 275; off Grenadines, station 241; and off Grenada (station unknown).

Distribution.—The known range of *M. miles* extends from the north coast of Cuba and Glover Reef, off British Honduras, to Grenada at the extreme southern end of the Lesser Antilles, and as far

south as Pernambuco, Brazil, if the "Challenger" specimens are correctly identified. The bathymetric range is from 159 to 484 fathoms.

MUNIDA SANCTI-PAULI Henderson

Munida sancti-pauli Henderson, 1885, Ann. Mag. Nat. Hist., ser. 5, vol. 16, no. 96, p. 411. Henderson, 1888, Rep. Sci. Res. H. M. S. Challenger. Zoology, vol. 27 (pt. 69), p. 142, pl. 3, figs. 6-6b. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 256. Milne Edwards & Bouvier, 1894, Rés. Camp. Sci. Monaco, fasc. 7, p. 85, pl. 8, figs. 11-22. Milne Edwards & Bouvier, 1899, Rés. Camp. Sci. Monaco, fasc. 13, p. 74. Milne Edwards & Bouvier, 1900, Expéd. Sci. "Travailleur" et "Talisman", Crust. Déc., pt. 1, p. 293, pl. 29, figs. 19-21. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 251. Stebbing, 1902, South African Crustacea, part 2, p. 30. Bouvier, 1922, Rés. Camp. sci. Monaco, fasc. 62, p. 44, pl. 4, figs. 12-13.

Two specimens of this species, a male with an abdominal parasite and an ovigerous female, were taken by "Atlantis" in 1940 east of St. Augustine, Florida, at station 3,781; 30° 58′ N., 79° 34′ W.; 265-290 fathoms; February 24, 1940.

There is also a male in the Museum of Comparative Zoölogy which was taken by the "Blake" in 1878-79 off Frederickstadt, St. Croix, at station 129 in 314 fathoms.

Despite the fact that Henderson's types were taken in much shallower water, our specimens agree very well with his description and figures. They have also been compared with several specimens taken by the "Talisman" off Morocco and the Canary Islands, and they seem to agree perfectly with these eastern Atlantic individuals. Although *M. sancti-pauli has* a rather extended range in the Atlantic, I cannot concur with Milne Edwards and Bouvier in their suggestion that *M. sancti-pauli, M. militaris, M. heteracantha* and *M. propinqua* represent a single variable and widespread species. All of the species of this group, including *M. constricta* and *M. miles*, are remarkably similar and differ only in minor characters but apparently these characters are sufficiently constant that little difficulty is encountered in determining the various species.

Distribution.—In the western Atlantic from off Florida to St. Paul's Rocks and in the eastern Atlantic from the Azores to the African coast in the region of the Canary Islands. It has also been recorded by Stebbing from off South Africa. The bathymetric range is from 60 to 758 fathoms.

Munida forceps A. Milne Edwards

(Fig. 15)

Munida forceps A. Milne Edwards, 1880, Bull. Mus. Camp. Zoöl. Harv., vol. 8, no. 1, p. 49. Perrier, 1886, Les Explorations Sous-Marines, text- fig. 109, p. 200. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 256. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 28, pl. 2, fig. 8. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 251.

Occurrence.

North coast of Cuba:

Old Bahama Channel off Punta Alegre, Camagüey Province; station 3.419; 180 fathoms; 2 females, 1 of which is ovigerous.

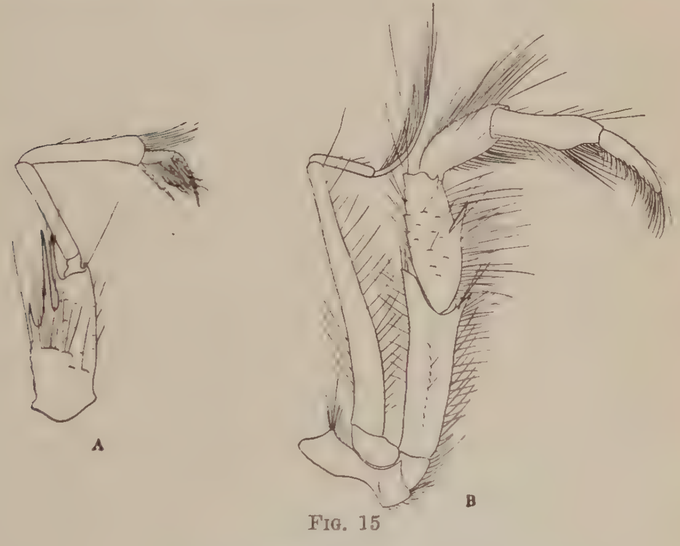


Fig. 15

Munida forceps

Female from "Atlantis" station 3,419. – A. Right antennule from above. × 5. – B. Right third maxilliped. × 5.

Remarks. – In addition to the male holotype, an ovigerous female was taken by the "Blake" at station 36. This specimen is the smallest of the four known specimens, having a carapace length of 12.1 mm.; the holotype has the carapace 16.2 mm. long and the "Atlantis" non-ovigerous and ovigerous females give comparative measurements of 18.0 and 13.08 mm. respectively. The form of the chelipeds, although somewhat variable, is sufficient to determine this

species at a glance. The row of spines across the gastric region is made up of from four to six spines in addition to one on each hepatic region, and there are two to four on the anterior carina of the second abdominal somite. The eyes are not as large and semicircular as in most species. The basal segment of the antennular peduncle and the form of the third maxillipeds are shown in the accompanying figures. The sternum is smooth and unarmed.

As noted in the type by Milne Edwards and Bouvier, the non-ovigerous female collected by "Atlantis" has four broad transverse bands of delicate purple on the carapace.

Distribution. – Previously known only from the type locality off Alacran Reef, north of Yucatán, in 84 fathoms.

Munida nuda Benedict

Munida nuda Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 265, text-fig. 14.

This species was not taken by "Atlantis", but the opportunity is taken to record four specimens in the Museum of Comparative Zoölogy. They were taken by the "Blake" at the following localities:

Northwest of the Dry Tortugas; station 11; 37 fathoms; 1 male, 1 female (cotypes of *M. miles*).

Gulf of Mexico; station 45; 101 fathoms; 1 ovigerous female.

Off St. Vincent; station 232; 88 fathoms; 1 female.

Benedict's type was found off Havana, Cuba, in 189 fathoms.

Munida microphthalma A. Milne Edwards

(Fig. 16)

Munida microphthalma A. Milne Edwards, 1880, Bull. Mus. Comp. Zool. Harv., vol. 8, no. 1, p. 51 (part). Henderson, 1888, Rep. Sci. Res. H. M. S. Challenger, Zoology, vol. 27 (pt. 69), p. 127, pl. 3, fig. 4. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 256. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 32, pl. 2, figs. 9-13. (?) Milne Edwards & Bouvier, 1900, Expéd. Sci. "Travailleur" et "Talisman", Crust. Déc., pt. 1, p. 292. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 251. Hansen, 1908, Danish Ingolf-Exped., vol. 3, pt. 2, p. 35. (?) Doflein & Balss, 1913, Wiss. Ergebn. deutsch. Tiefsee-Exped. (Valdivia), bd. 20, lf. 3, p. 142, text-fig. 8. Bouvier, 1922, Rés. Camp. Sci. Monaco, fasc. 62, p. 45, pl. 1, fig. 3.

Not *M. microphthalma* (?) Faxon, 1895, Mem. Mus. Comp. Zoöl. Harv., vol. 18, p. 78.



FIG. 16

Munida microphthalma

Right third maxilliped of topotype male from "Blake" station 227. × 10.

Occurrence.

North coast of Cuba:

Off Bahia de Cárdenas, Matanzas Province; station 2,995; 370-605 fathoms; 2 males, 5 females, 3 of which are ovigerous; station 2,996; 470-665 fathoms; 2 males, 1 ovigerous female.

Remarks. – This is a medium-sized species, males attaining a carapace length of 19.1 mm. and females 17.0 mm.; the smallest ovigerous female examined has the carapace 9.8 mm. long. *M. microphthalma* is characterized by the small eyes in which the cornea is little, if at all, wider than the stalk, the spines of the dorsal surface

of the carapace confined to a row of six across the gastric region; a row of spines on the second abdominal somite and two spines on the inner margin of the merus of the third maxillipeds.

Milne Edwards and Bouvier (1900, p. 292) state that *M. microphthalma* is apparently a variable species which has an extended and nearly world-wide distribution in the warmer seas, and they suggest that M. *microps* Alcock from the Indian Ocean is probably but a variety of the West Indian form. These authors were probably misled by the fact that they confused two species under this name in the "Blake" collection, and by the fact that the specimen collected in the eastern Pacific by the "Albatross" and questionably referred to *M. microphthalma* by Faxon differed from the West Indian specimens of that species. Examination of the material in the Museum of Comparative Zoölogy discloses that the male specimen taken by the "Blake" at station 2 is not *M. microphthalma*, but *M. subcaeca*, and that the "Albatross" specimen from the Pacific should be referred to *M. perlata* Benedict, as it has but a single spine on the inner margin of the merus of the third maxilliped. There can be hardly a doubt that *M. microps* is distinct, for it has several spines on the dorsal surface of the carapace in addition to the gastric row and the chelipeds are longer and much more slender. Probably the specimens recorded from the eastern Atlantic by Milne Edwards and Bouvier (1900) and by Doflein and Balss (1913) are the true *M. microphthalma*, but a re-examination of these specimens is desirably in the light of our present knowledge. The "Challenger" specimen from off Culebra Island is undoubtedly *M. microphthalma* and probably the specimen from off Ascension Island is also, but the young male from the Pacific north of the Kermadec Islands probably is a different species inasmuch as Henderson notes that the second abdominal somite is unarmed.

Distribution. – *M. microphthalma* is known from several stations in the West Indian region from the Gulf of Mexico to Martinique and St. Vincent in depths varying from 390 to 1030 fathoms. It is probably also found in the eastern Atlantic from the Bay of Biscay to the Cape Verde Islands and Ascension Island in 343 to 1183 fathoms, and in the north Atlantic south of Iceland in 108-1144 fathoms.

MUNIDA SUBCAECA Bouvier

(Figs. 17, 18)

Munida subcaeca Bouvier, 1922, Rés. Camp. sci. Monaco, fasc. 62, p. 46, pl. 5, figs. 2-3.

Occurrence.

North coast of Cuba:

Off Bahía de Cárdenas, Matanzas Province; station 3,471; 500 fathoms; 1 ovigerous female.

Off Bahía de Nuevitas, Camagüey Province; station 3,380; 460 fathoms; 1 female.

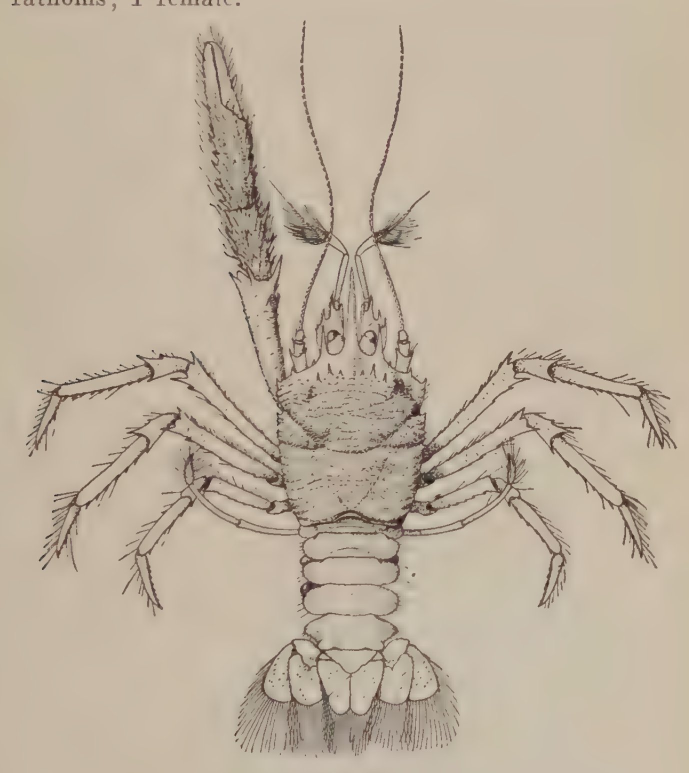


FIG. 17

Munida subcaeca

Ovigerous female from "Atlantis" station 3,471. × 4.

Remarks.—Both of these specimens are of practically the same size, the carapace measuring about 5.2 mm. to the base of the rostral spine. Bouvier has pointed out that this species approaches some of

the species of *Munidopsis.* This is further borne out by the fact that the eggs are much larger and fewer in number than in any other species of *Munida* examined.

One of the cotypes of *M. microphthalma*, a male taken off Morro Castle, Cuba, in 805 fathoms at "Blake" station 2, and another male taken by the "Blake" off Hams Bluff, St. Croix, in 580 fathoms at station 131, belong to this species rather than to *M. microphthalma.*

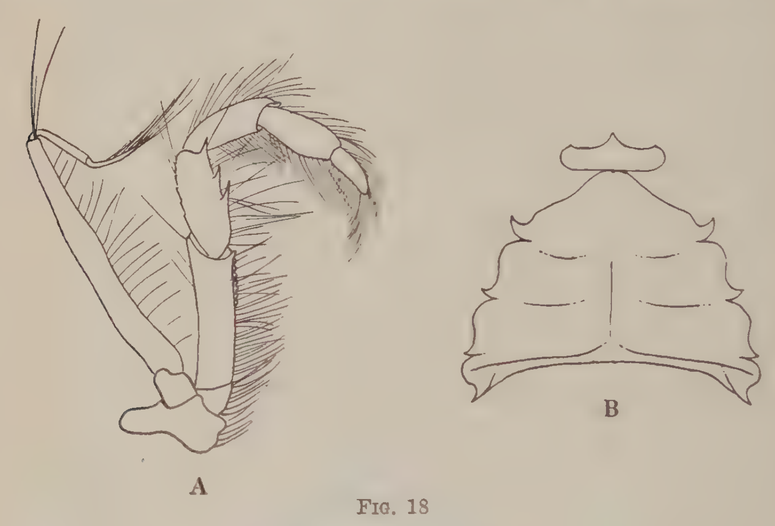


Fig. 18

Munida subcaeca

Ovigerous female from "Atlantis" station 3,471. – A. Right third maxilliped. × 15. – B. Sternum. × 15.

Distribution. – Known from the West Indies from off the north coast of Cuba and off St. Croix in 460 to 805 fathoms, and in the eastern Atlantic from off Madeira and the Canary Islands in 800 to 930 fathoms.

Munida sculpta Benedit

(Fig. 19)

Munida sculpta Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 270, text-fig. 18.

Occurrence.

Bahamas:

Eight miles northeast of Great Isaac Island, north of the Bimini Group; station 2,951; 155 fathoms; 3 males, 1 female.

Remarks. – One of the males is about as large as one of the paratype males from station 27 of the Iowa State University Expedition with which the present series has been compared; the carapace measures 13.2 mm. to the base of the rostral spine. The other three specimens are considerably smaller. Benedict's description and figure characterize this species well, although adult males have the chelae somewhat broader than in that figure and the fixed finger is arched downward to form a gape at the base. The small distal spine on the inner margin of the merus of the third maxillipeds, shown in the accompanying figure, may be present or not, but the series of three prominent spines near the middle of the inner edge of that segment are always present.

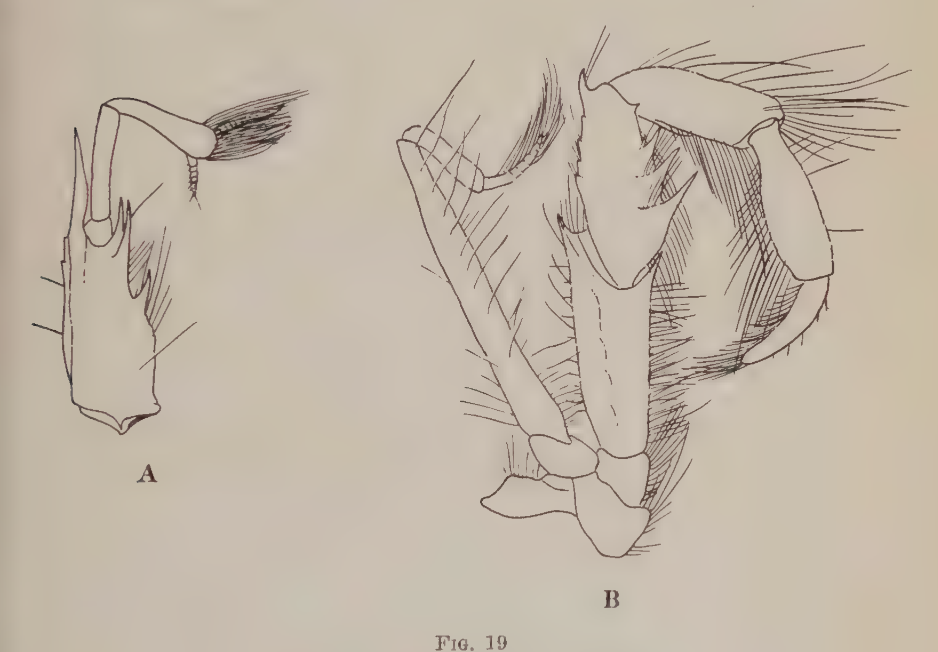


Fig. 19

Munida sculpta

Male from "Atlantis" station 2,951. – A. Right antennule from above. × 8. – B. Right third maxilliped. × 8.

Distribution. – This is the first record for the species since that of the type series from north of Cuba and the Caribbean Sea. The only depth heretofore recorded was 98 fathoms at "Albatross" station 2,150.

MUNIDA IRRASA A. Milne Edwards

Munida irrasa A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 49. Faxon, 1895, Mem. Mus. Comp. Zoöl. Harv., vol. 18, p. 73. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 251. Hay & Shore, 1918, Bull. U. S. Bur. Fish., vol. 35, p. 402, pl. 28, fig. 8.

Munida cariboea A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 49.

Munida caribaea Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 256. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 25, pl. 1, figs. 16-20, pl. 2, fig. 1. Doflein & Balss, 1913, Wiss. Ergebn. deutsch. Tiefsee-Exped. (Valdivia), bd. 20, lf. 3, p. 172.

Occurrence.

North coast of Cuba:

Off Playa Baracoa, Havana Province; station 3,303; 260 fathoms; 1 female.

Old Bahama Channel off Punta Alegre, Camagüey Province; station 3,414; 230 fathoms; 1 male.

Old Bahama Channel off Cayo Coco, Camagüey Province; station 3,393; 220 fathoms; 2 males, 1 of which is soft-shelled, and 1 ovigerous female; station 3,396; 180 fathoms; 1 male; station 3,397; 180 fathoms; 2 males, 1 female with abdominal parasites; station 3,398; 180 fathoms; 2 females, 1 with abdominal parasites; station 3,399; 180 fathoms; 1 male with abdominal parasites; station 3,400; 180 fathoms; 1 male.

South coast of Cuba:

Bahia de Cochinos, Santa Clara Province; station 3,320; 185 fathoms; 1 ovigerous female.

Remarks. – This is a rather small species, males having a maximum carapace length of 11.1 mm., and females 14.1 mm.; the smallest ovigerous female examined has the carapace only 4.0 mm. long. The species is characterized by the anteriorly narrowed carapace; a row of about ten spines across the gastric region in addition to one or two on each hepatic region, two to four on each triangular area and one to four on either side behind the cervical groove on the inner portion of each branchial region; anterolateral spine long, followed by six distinct lateral spines; the rostral spine several times the length of the supraoculars which do not extend as far as the cornea; and the unarmed posterior margin of the carapace and all of the abdominal somites. Although it is very near *M. iris*, not only as regards the general appearance of the body and chelipeds but also

in the form of the basal segment of the antennular peduncle and sternum, *M. irrasa* may be distinguished by the shorter supraocular spines, absence of spines on the second abdominal somite and usually by the presence of three or four spines on the inner margin of the merus of the third maxillipeds where there is but a single spine in *M. iris*.

As Faxon and Benedict have pointed out, there is no indication as to which of these two species Stimpson (Ann. Lyc. Nat. Hist. N. Y., vol. 7, 1860, p. 244) called *M. caribaea* and, since the type has been destroyed, it seems best to disregard that name entirely.

Distribution. – There are specimens of this species in the Museum of Comparative Zoölogy from localities ranging from southern Florida and the Gulf of Mexico as far south and east as Grenada and Barbados in the Lesser Antilles in depths of 30 to 260 fathoms. It has also been recorded by Hay and Shore from off Cape Lookout, North Carolina, in depths of 47 and 66 fathoms.

MUNIDA LONGIPES A. Milne Edwards

Munida longipes A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 50. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 257. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 44, pl. 3, figs. 9-13. Benedict, 1901, Bull. U. S. Fish Comm. for 1900, vol. 20, pt. 2, p. 147. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 252. Hay & Shore, 1918, Bull. U. S. Bur. Fish., vol. 35, p. 402, pl. 28, fig. 9.

Munida paynei Boone, 1927, Bull. Bingham Oceanogr. Coll., vol. 1, art. 2, p. 53, text-fig. 11.

Occurrence.

Bahamas:

Western part of Northwest Providence Channel; station 2,950; 285 fathoms; 1 male, 5 ovigerous females.

North coast of Cuba:

Off Playa Baracoa, Havana Province; station 3,305; 330 fathoms; 2 males, 1 female; station 3,306; 330 fathoms; 1 female.

Off Havana, Havana Province; station 3,003; 240-300 fathoms; 1 male.

Off Bahia de Matanzas, Matanzas Province;; station 2,999; 145-230 fathoms; 1 ovigerous female; station 3,000; 170-255 fathoms; 1 ovigerous female; station 3,483; 285 fathoms; 1 male, 1 female; station 3,485; 385 fathoms; 1 male, 1 ovigerous female.

Nicholas Channel, south of Cay Sal Bank; station 2,987; 280-300 fathoms; 7 males, 1 of which has a branchial parasite; station 2,987A; 285-300 fathoms; 25 males, 2 intersexes, 11 females, 5 of which are ovigerous and 1 has an abdominal parasite; station 2,987C; 300-315 fathoms; 2 males; station 3,443; 325 fathoms; 14 males, 2 females; station 3,444; 320 fathoms; 12 males, 5 females, 1 of which is ovigerous; station 3,445; 330 fathoms; 8 males, 6 females, 2 of which are ovigerous and 1 soft-shelled; station 3,446; 360 fathoms; 7 males, 1 of which has a branchial parasite and 1 is soft-shelled. 3 females; station 3,447; 375 fathoms; 4 males, 3 intersexes. 3 females, 1 of which is ovigerous, 1 young (2 intersexes and 1 female with abdominal parasites); station 3,448; 380 fathoms; 3 intersexes, 4 females (all 3 intersexes and 2 of the females have abdominal parasites and 1 of the females also has a branchial parasite); station 3,449; 390 fathoms; 2 females, 1 of which has an abdominal parasite; station 3,451; 405 fathoms; 1 male, 1 female.

South end of Santaren Channel, southeast of Cay Sal Bank; station 2,985; 250 fathoms; 1 ovigerous female.

Off Caibarién, Santa Clara Province; station 3,431; 245 fathoms; 1 male, 1 ovigerous female; station 3,432; 250 fathoms; 2 males, 10 ovigerous females; station 3,434; 260 fathoms; 6 males 24 females, 23 of which are ovigerous, 1 young (1 male and the young specimen have branchial parasites); station 3,435; 255 fathoms; 4 males, 32 ovigerous females; station 3,436; 255 fathoms; 1 male, 28 females, 27 of which are ovigerous; station 3,437; 260 fathoms; 14 males, 36 females, 34 of which are ovigerous; station 3,438; 265 fathoms; 3 males, 24 ovigerous females; station 3,439; 295 fathoms; 5 males, 16 females, 12 of which are ovigerous and 3 have abdominal parasites; station 3,442; 335 fathoms; 2 males, 1 intersex with an abdominal parasite.

Western end of old Bahama Channel; station 2,983; 235-260 fathoms; 6 males, 13 ovigerous females; station 2,983A; 235 fathoms; 2 males, 3 ovigerous females; station 2,984; 240-250 fathoms; 1 male, 1 ovigerous female.

Old Bahama Channel off Punta Alegre, Camagüey Province; station 2,980A; 220-260 fathoms; 1 ovigerous female; station 2,981; 225 fathoms; 1 ovigerous female; station 2,981C; 195 fathoms; 5 males, 6 ovigerous females; station 2,981D; 190-

230 fathoms; 1 male, 2 ovigerous females; station 2,982; 210 fathoms; 4 males, 10 ovigerous females; station 2,982A; 210 fathoms; 9 males, 24 females, 22 of which are ovigerous and the remaining 2 have abdominal parasites; station 2,982B; 205-230 fathoms; 3 males, 12 females, 11 of which are ovigerous; station 2,982C; 195-225 fathoms; 5 males, 11 ovigerous females; station 2,982D; 150-180 fathoms; 1 ovigerous female; station 3,410; 260 fathoms; 1 ovigerous female; station 3,411; 260 fathoms; 7 males, 8 females, 7 of which are ovigerous and the other has a branchial parasite.

Old Bahama Channel off Cayo Coco, Camagüey Province; station 3,392; 225 fathoms; 1 male, 1 ovigerous female; station 3,405; 235 fathoms; 7 males, 11 females, 10 of which are ovigerous.

Old Bahama Channel off western end of Cayo Romano, Camagüey Province; station 3,387; 245 fathoms; 3 ovigerous females.

Off Puerto Tánamo, Oriente Province; station 3,371; 295 fathoms; 1 male, 3 ovigerous females; station 3,374; 300 fathoms; 1 male; station 3,376; 285 fathoms; 1 male.

South coast of Cuba:

Bahia de Cochinos, Santa Clara Province; station 2,960; 270 fathoms; 1 male, 1 female; station 2,961D; 195-235 fathoms; 1 female; station 2,963D; 220-275 fathoms; 3 ovigerous females, 1 young; station 3,323; 290-320 fathoms; 1 male, 2 ovigerous females; station 3,324; 320 fathoms; 1 male, 1 female, 1 young; station 3,325; 300 fathoms; 1 male, 1 ovigerous female.

Remarks.—This is one of the commonest and most easily recognized species of *Munida* known from the western Atlantic. It is a medium-sized form, males attaining a carapace length of 17.2 mm. and females 20.8 mm.; the smallest ovigerous female examined has the carapace 8.2 mm. long. The Cuban specimens obtained by "Atlantis" seem to be somewhat smaller than the "Blake" specimens from the Lesser Antilles, none of the former attaining the maximum measurements given above. The short rostral spine, no longer than the divergent supraorbital spines, and the long ambulatory legs, which extend quite as far as the chelipeds, separates the species from all others from this region.

As is so often true of common and wide-ranging species, *M. longipes* is somewhat variable. The spine on the hepatic region may be present or absent; the row of spines on the inner portion of each branchial region may be made up of as many as four spines, but more often it is reduced to one; the spine on the cardiac region may, in rare cases, be accompanied by two or three small spines behind it; just as rarely there may be four, rather than two, spines on the fourth abdominal somite; and the sternum may be covered with short, rugose lines, although usually it is largely smooth with a blunt tooth at the insertions of the chelipeds and the first two pairs of ambulatory legs. It will be seen from this that *M. paynei* falls within the limits of variation of *M. longipes* and must be synonymized with it. Apparently large specimens have a greater complement of spines than smaller ones, the extra spines on the cardiac region and the extra pair on the fourth abdominal somite having been observed only in a few of the largest specimens and the two characters are seldom found in the same individual as in the type of *M. paynei*.

The parasitized intersexes noted above in the list of material apparently represent males in which the long, female-like pleopods have become secondarily developed due to the influence of the rhizocephalan parasite. Females so parasitized presumably undergo no such obvious external change.

In addition to the localities listed for this species by A. Milne Edwards, *M. longipes*, was taken at "Blake" stations 171 (off Guadeloupe), 193 (off Martinique), 275 (off Barbados), 240 (off the Grenadines) and 258 (off Grenada).

Distribution. – From off Beaufort, North Carolina, and the Bahamas to Grenada in the Lesser Antilles and westward as far as the coast of British Honduras in from 159 to 405 fathoms.

MUNIDA SCHROEDERI Chace
(Figs. 20, 21)

Munida schroederi Chace, 1939, Mem. Soc. Cubana Hist. Nat., vol. 13, no. 1, p. 44.

Occurrence.

Bahamas:

Eight miles northeast of Great Isaac Island, north of the Bimini Group; station 2,951; 155 fathoms; 11 males, 9 females, 4 of which are ovigerous (holotype and paratypes).



FIG. 20
Munida schroederi. Holotype. × 2 +

North coast of Cuba:

Off Playa Baracoa, Havana Province; station 3,302; 230 fathoms; 1 male; station 3,303; 260 fathoms; 3 males, 6 females, 4 of which are ovigerous.

Off Bahia de Matanzas, Matanzas Province; station 3,000; 170-255 fathoms; 2 ovigerous females (paratypes); station 3,463; 230 fathoms; 1 male; station 3,465; 175 fathoms; 2 ovigerous females; station 3,466; 200 fathoms; 1 male; station 3,467; 215 fathoms; 2 ovigerous females; station 3,478; 240 fathoms; 3 males, 1 ovigerous female, 1 young; station 3,479; 210 fathoms; 1 male; station 3,482; 190 fathoms; 5 males, 5 females, 3 of which are ovigerous.

Old Bahama Channel off Cayo Coco, Camagüey Province; station 3,391; 220 fathoms; 2 males, 4 females, 3 of which are ovigerous; station 3,393; 220 fathoms; 4 males, 7 females, 4 of which are ovigerous and 1 has a branchial parasite; station 3,400; 180 fathoms; 5 males, 1 with abdominal parasites; 5 females, 2 of which are ovigerous, 2 young; station 3,401; 235 fathoms; 3 males, 3 females, 2 of which are ovigerous, 1 young; station 3,404; 215 fathoms; 3 males, 2 females, 1 of which is ovigerous.

Old Bahama Channel off the western end of Cayo Romano, Camagüey Province; station 3,386; 220 fathoms; 1 male, 1 young; station 3,390; 180 fathoms; 2 males, 1 ovigerous female.

South coast of Cuba:

Bahia de Cochinos, Santa Clara Province; station 2,960; 270 fathoms; 2 males, 5 females, 4 of which are ovigerous and 1 has an abdominal parasite (paratypes); station 2,961C; 190-210 fathoms; 9 males, 8 females, 4 of which are ovigerous and 1 has an abdominal parasite (paratypes); station 2,961D; 195-235 fathoms; 11 males, 12 females, 10 of which are ovigerous (paratypes); station 2,962, 200-210 fathoms; 6 males, 3 ovigerous females (paratypes); station 2,962B; 180-190 fathoms; 4 males, 2 ovigerous females (paratypes); station 2,962C; 210 fathoms; 6 males, 7 females, 5 of which are ovigerous (paratypes); station 2,962D; 175-210 fathoms; 2 ovigerous females (paratypes); station 2,963; 190-180 fathoms; 56 males, 74 females, 69 of which are ovigerous (1 male and 1 female with abdominal parasites) (paratypes); station 2,963C; 205 fathoms; 3 males, 5 females, 4 of which are ovigerous and 1 has an abdominal parasite (paratypes); station 3,331; 230-260 fathoms; 1 male, 2 females, 1 of which is ovigerous.

A lot of 13 additional paratypes, 7 males, 6 females, 2 of which are ovigerous and 1 with an abdominal parasite, have been examined; these are without data but were taken by "Atlantis" in 1938; presumably off the north coast of Cuba.

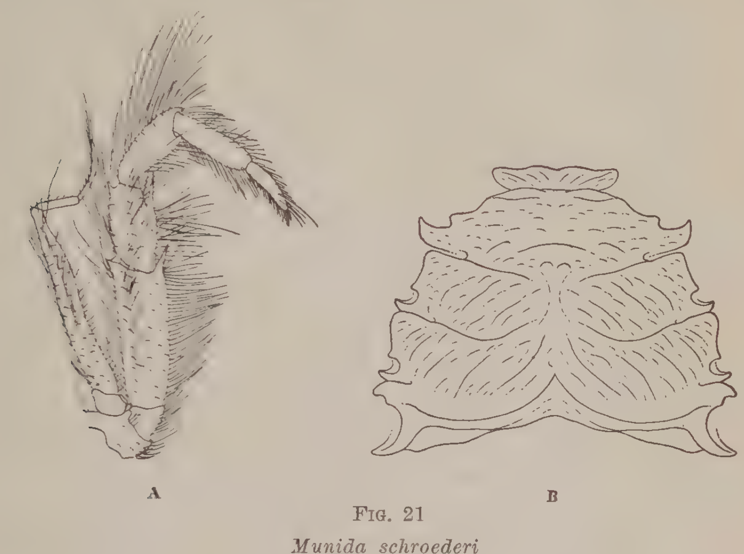


FIG. 21
Munida schroederi
Holotype. – A. Right third maxilliped. × 5. – B. Sternum. × 5.

Description. – Carapace broad, depressed and very spinose. It is widest at the posterior third. Rostrum usually more than twice as long as the supraocular spines which reach to the middle of the eyes. There are about six principal longitudinal rows of spines on the dorsal surface of the carapace, two median on the gastric and cardiac regions and two paired behind and outside of the line of the supraocular spines and on the inner portion of each branchial region. There may be a single median spine slightly behind the line of the supraoculars. The remainder of the carapace is more or less covered with many small spines arising from the transverse striae. There are six or seven lateral spines behind the anterolateral spine, most of them turned inward. The posterior margin of the carapace is usually armed with 11 to 18 small spines.

Second and third abdominal somites armed with four or more widely spaced spines on the anterior margin and two or more smaller ones near the posterior margin. The fourth somite is similarly armed with four anterior spines, but near the posterior margin are three or five closely set spines, one of which is median.

Thoracic sternum as figured.

Basal segment of antennular peduncle armed with two spines at the anterolateral angle, one above the other, followed by a large and a small spine on the outer margin; there is a single small spine at the

inner distal angle. Basal segment of antennal peduncle with a strong inner spine; the following segment with a strong inner and a smaller outer spine. The antennal flagella are nearly as long as the chelipeds.

Third maxillipeds armed with a long spine at the antero-median angle of the ischium and a similar spine at the middle of the inner margin of the merus.

The smooth, oblique surface behind each eye is irridescent.

The chelipeds, measured from the ischial fracture, are about four and one-half times the length of the carapace to the base of the rostral spine. Merus subquadrate with rows of spines at each angle except the outer ventral. Carpus somewhat more cylindrical due to the absence of the row of spines on the outer distal angle and the reduction of those along the inner ventral angle to a single spine. Palm also subcylindrical with a row of spines at the inner dorsal angle and two or three scattered ones on the external face. Fingers slightly shorter than the palm; the fixed finger curves outward at the base to form a slight gape in large males and is bifid at the tip.

Ambulatory legs flattened. The merus has a row of spines on either margin, the carpus a dorsal or anterior row and a single subterminal spine on the ventral or posterior edge and the propodus is unarmed except for a single small subterminal spine on the posterior margin. The dactyls are sinuous, with a proximal lobe on the lower margin, and unarmed.

Measurements. – Length of holotype male from tip of rostrum to end of telson 32.8 mm.; length of carapace and rostrum 15.8 mm.; length of rostral spine 3.8 mm.; greatest breadth of carapace 11.8 mm. There is little difference in size between males and females; the largest female, an ovigerous specimen, has the carapace 16.8 mm. long to the base of the rostral spine, and the largest male 17.3 mm. The smallest ovigerous female examined has a carapace length of 9.2 mm. The chelipeds of females are more slender and slighter shorter than those of the opposite sex; in males they are from 4.4 to 5.0 times the length of the carapace and in females from 3.9 to 4.8 times as long.

Remarks. – The large series of specimens of *M. schroederi* available for study shows that the species is subject to some variation. Most of the specimens from stations 3,000 and 3,303 are markedly atypical in having a somewhat shorter rostral spine, sometimes as few as two spines on the posterior margin of the carapace, no posterior spines on the second and third abdominal somites and but a single posterior one on the fourth somite. Practically all of the specimens from Bahía Cochinos, where the species was found in abundance in 1938, differ slightly in general appearance from the

type due to the shorter rostral spines and the more prominent spines scattered over the dorsal surface of the carapace.

Although the carapace is hispid and broad as in *M. hispida* Benedict from American Pacific waters, *M. schroederi* may be distinguished easily by the shorter rostral and much shorter supraocular spines and by the fact that the Atlantic species has but one, rather than two spines on the inner margin of the merus of the third maxillipeds.

Distribution. – In addition to the specimens from the Bahaman and Cuban stations cited above, a lot of four specimens of this species, one male and three females, one of which is ovigerous, was taken by the "Blake" in 1878-79 at station 164, off Guadeloupe in 150 fathoms; these is no evidence that this lot was ever seen by A. Milne Edwards and Bouvier. The bathymetric range of the species is seen to be from 150 to 270 fathoms.

Munida affinis A. Milne Edwards

(Fig. 22)

Munida affinis A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 48. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 257. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 53, pl. 3, fig. 14.

Not *M. affinis* Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 252.

Occurrence.

North coast of Cuba:

Western end of Old Bahama Channel; station 2,983A; 235 fathoms; 1 male.

Old Bahama Channel off Cayo Coco, Camagüey Province; station 3,405; 235 fathoms; 2 males.

Off Puerto Tánamo, Oriente Province; station 3,374; 300 fathoms; 1 male.

South coast of Cuba:

Bahia de Cochinos, Santa Clara Province; station 2,960; 270 fathoms; 1 male, 1 ovigerous female; station 2,961D; 195-235 fathoms; 2 males, 3 females, 2 of which are ovigerous; station 2,962C; 210 fathoms; 1 male, 3 ovigerous females; station 2,963D; 220-275 fathoms; 2 males, 1 ovigerous female; station 2,963E; 220-235 fathoms; 7 males, 9 females, 8 of which are ovigerous; station 3,328; 260-275 fathoms; 1 male, 3 females, 2 of which are ovigerous; station 3,331; 230-260 fathoms; 1 male, 2 ovigerous females.

Remarks. – This is a medium-sized species, males attaining a carapace length to base of rostral spine of 17.8 mm., and females 15.9 mm.; the smallest ovigerous female examined has the carapace 12.5 mm. long. This form may be distinguished from related species by the spinose striae on the carapace, an armature of 6 to 15 spines on the posterior margin of the carapace, four or more spines on the anterior carina of each of the second, third and fourth abdominal somites and sometimes a few obscure denticles on the posterior carinae of these somites, a small spine on each segment of the sternum near the insertion of the appendages, five to seven long spines—two of which are terminal—on the basal segment of the antennular peduncle and a large lamellate subterminal spine on the merus of the cheliped. In recently preserved specimens this last spine is characteristically tinged with red and there is a red spot around the spine at the antero-internal angle of each branchial region.

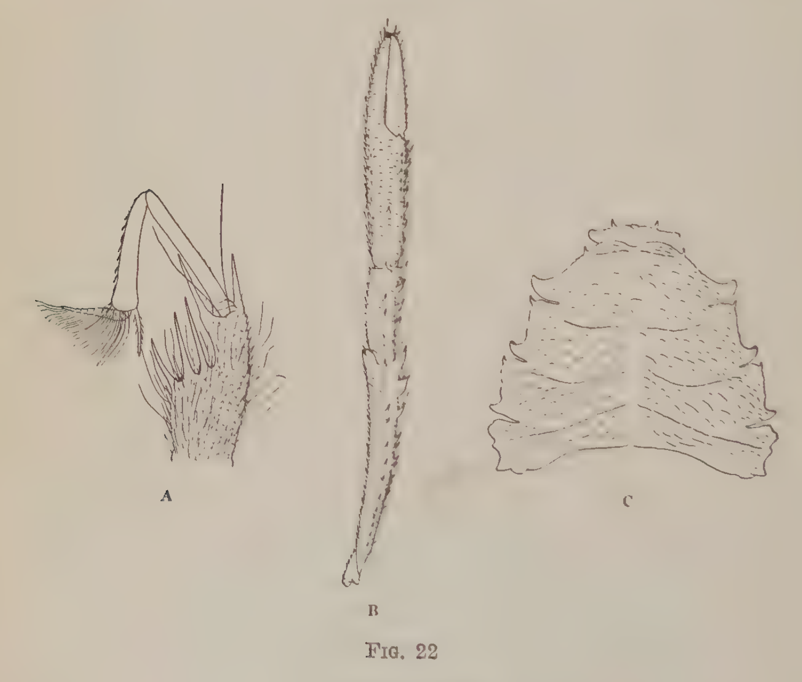


Fig. 22

Munida affinis

A. Left antennule of male from "Atlantis" station 2,963D, from above. × 5. – B. Left cheliped of a male from the same station, from above. × 1. – C. Sternum of a male from station 2,962C. × 5.

In the key given by Benedict (1902, p. 252), the species referred to as *M. affinis* is in reality *M. stimpsoni; M. affinis* belongs in the first part of section four of that key, among the species having more than two spines on the posterior margin of the carapace. Therefore, the records given by Benedict (p. 305) must be ignored in determining the distribution of *M. affinis* until the specimens can be reexamined.

In the collection of the Museum of Comparative Zoölogy there is an additional ovigerous female specimen of *M. affinis* taken at the type locality, "Blake" station 148, but apparently never seen by Milne Edwards and Bouvier.

Distribution. – Aside from the "Atlantis" series noted above, this species is definitely known only from the type locality off St. Kitts. The bathymetric range is from 195 to 300 fathoms.

MUNIDA FLINTI Benedict

Munida Stimpsoni A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 47 (part). Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 48 (part), pl. 4, fig. 1.

Munida flinti Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311 p. 258, text-fig. 9.

Although this species is not represented in the "Atlantis" collections, it was taken at two stations by the "Blake". A male was taken north of Alacran Reef in 1877-78 at station 36 in 84 fathoms, and a male and a female off Grenada in 1878-79 at station 262 in 92 fathoms. All three of these specimens are cotypes of *M. stimpsoni* and the first was figured by Milne Edwards and Bouvier as that species. These specimens have been compared with paratypes of *M. flinti* kindly loaned by the U. S. National Museum.

MUNIDA STIMPSONI A. Milne Edwards

(Fig. 23)

Munida stimpsoni A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 47 (part). Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 257. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 48 (part), pl. 4, figs. 2-13 (not fig. 1).

Munida affinis Benedict, 1901, Bull. U. S. Fish Comm. for 1900, vol. 20, pt. 2, p. 147. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 252.

Not *M. stimpsoni* Henderson, 1888, Rep. Sci. Res. H. M. S. Challenger, Zoology, vol. 27 (pt. 69), p. 126, pl. 14, fig. 1. Benedict, 1901, p. 147. Benedict, 1902, p. 252.

Occurrence.

North coast of Cuba:

Off Playa Baracoa, Havana Province; station 3,303; 260 fathoms; 3 males, 5 females, 3 of which are ovigerous.

Off Bahia de Matanzas, Matanzas Province; station 3,463; 230 fathoms; 2 young; station 3,466; 200 fathoms; 1 ovigerous female; station 3,479; 210 fathoms; 1 female; station 3,482; 190 fathoms; 3 males, 3 females, 2 of which are ovigerous.

Off Bahia de Cárdenas, Matanzas Province; station 3,474; 490 fathoms; 1 ovigerous female.

Off Caibarién, Santa Clara Province; station 3,420; 190 fathoms; 4 males, 4 females, 2 of which are ovigerous; 1 young; station 3,421; 235 fathoms; 1 male, 3 females, 2 of which are ovigerous; station 3,422; 235 fathoms; 1 male; station 3,428; 240 fathoms; 1 female, 1 young.

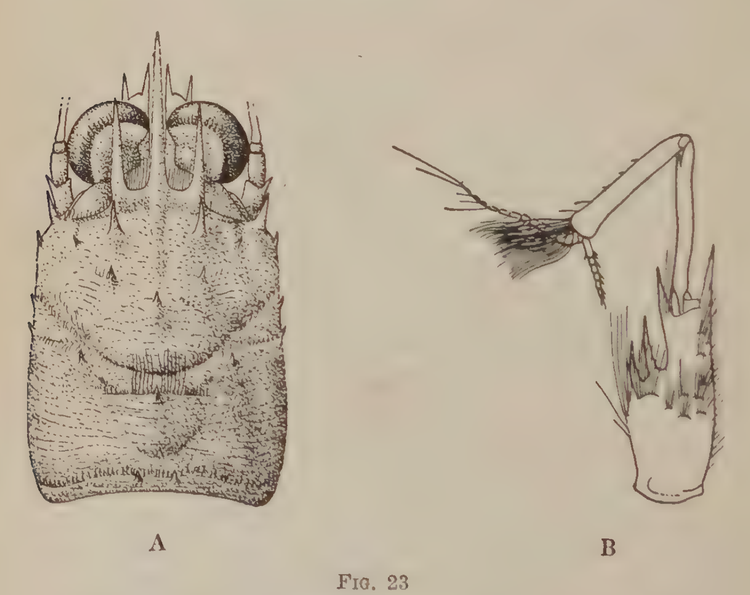


Fig. 23

Munida stimpsoni

A. Carapace of male from "Atlantis" station 2,961D. × 3. – B. Right antennule of male from station 3,398, from below. × 7½.

Old Bahama Channel off Punta Alegre, Camagüey Province; station 2,982D; 150-180 fathoms; 10 males, 2 of which have external parasites, and 7 females, 4 of which are ovigerous; station 2,982E; 150-180 fathoms; 21 males, 10 females, 4 of which are ovigerous and 1 has external parasites, 2 young, 1 of which has external parasites and the other a branchial paras te; station 3,409; 200 fathoms; 2 males, 1 ovigerous female; station 3,412; 235 fathoms; 3 males, 1 ovigerous female; station 3,413; 215 fathoms; 4 males, 5 females, 2 of which are ovigerous, 2 young; station 3,414; 230 fathoms; 3 males, 1 of which has external parasites, 1 female, 1 young; station 3,415; 210 fathoms; 4 males, 2 ovigerous females; station 3,416; 200 fathoms; 8 males, 1 of which is solft-shelled and 1 has a branchial parasite, 13 females, 11 of which are ovigerous and 1 has an abdominal parasite, 1 young; station 3,417; 200 fathoms; 9 males, 12 females, 8 of which are ovigerous and 1 has external parasites, 3 young, 1 of which has a branchial parasite; station 3,418; 195 fathoms; 5 males, 4 ovigerous females; station 3,419; 180 fathoms; 9 males, 4 females, 3 of which are ovigerous.

Old Bahama Channel off Cayo Coco, Camagüey Province; station 3,391; 220 fathoms; 1 young male; station 3,392; 225 fathoms; 1 male with external parasites; station 3,394; 1 male, 2 females, 1 of which is ovigerous; station 3,397; 180 fathoms; 1 female with external parasites; station 3,398; 180 fathoms; 2 males; station 3,399; 180 fathoms; 2 ovigerous females; station 3,400; 180 fathoms; 1 young male; station 3,401; 235 fathoms; 1 male, 1 female; station 3,403; 210 fathoms; 3 males, 1 female, 1 young; station 3,404; 215 fathoms; 2 females, 1 of which is ovigerous; station 3,405; 1 ovigerous female, 1 young.

Old Bahama Channel off western end of Cayo Romano, Camagüey Province; station 3,386; 220 fathoms; 1 ovigerous female; station 3,389; 220 fathoms; 1 male; station 3,390; 180 fathoms; 1 male.

Off Puerto Tánamo, Oriente Province; station 3,375; 230 fathoms; 1 ovigerous female; station 3,376; 285 fathoms; 8 males, 7 ovigerous females, 1 young.

South coast of Cuba:

Bahia de Cochinos, Santa Clara Province; station 2,960; 270 fathoms; 14 males, 4 females, 3 of which are ovigerous, 2

young; station 2,961C; 190-210 fathoms; 12 males, 5 ovigerous females; station 2,961D; 195-235 fathoms; 19 males, 21 females, 15 of which are ovigerous, 4 young; station 2,962; 200-210 fathoms; 5 males, 4 females, 2 of which are ovigerous; station 2,962B; 180-190 fathoms; 6 males; 2 females, 1 of which is ovigerous, 4 young, 1 of which has a branchial parasite and 1 an abdominal parasite; station 2,962C; 210 fathoms; 9 males, 9 females, 7 of which are ovigerous; station 2,962D; 175-210 fathoms; 3 males; station 2,963; 190-189 fathoms; 8 males, 11 females, 10 of which are ovigerous; station 2,963B; 150-170 fathoms; 18 males, 6 females, 5 of which are ovigerous and the other has a branchial parasite; station 2,963C; 205 fathoms; 7 males, 6 females, 5 of which are ovigerous; station 2,963D; 220-275 fathoms; 1 ovigerous female; station 2,963E; 220-235 fathoms; 6 males, 9 ovigerous females; station 3,319; 195-215 fathoms; 12 males, 1 of which is soft-shelled and 2 have branchial parasites, 12 females, 8 of which are ovigerous, 1 has a branchial parasite and 1 has an abdominal parasite, 2 young; station 3,320; 185 fathoms; 5 males, 5 females, 3 of which are ovigerous and 1 has an abdominal parasite, 1 young; station 3,328; 260-275 fathoms; 11 males; 14 females, 7 of which are ovigerous; station 3,331; 230-260 fathoms; 3 males, 1 young; station 3,332; 175-225 fathoms; 1 male, 1 female; station 3,334; 185-195 fathoms; 2 males, 2 ovigerous females; station 3,335; 200 fathoms; 3 males, 1 ovigerous female, 1 young; station 3,336; 200-240 fathoms; 3 males, 3 ovigerous females, 1 young.

A single additional ovigerous female was taken by "Atlantis" in 1938, but the station data is missing.

Remarks.—The *M. stimpsoni* group contains a number of closely allied species in the West Indian region. Examination of the series of cotypes of *M. stimpsoni* in the Museum of Comparative Zoölogy discloses that Milne Edwards confused no less than seven species with this one, and the specimen from which the figure of the entire animal was made for Milne Edwards' and Bouvier's final "Blake" report (1897, pl. 4, fig. 1) is really *M. flinti*. From the original and later descriptions, it is apparent that Milne Edwards used the commonest form as a basis for these descriptions and that species has been retained here as the typical *M. stimpsoni*. It can be distinguished from related forms by the numerous, broken and indistinct striations

on the carapace, the presence of a single pair of spines on the posterior margin of the carapace, relatively long supraocular spines which reach as far as, or somewhat beyond, the eyes, the presence of a median posterior spine on the fourth abdominal somite and the fairly rugose sternum. It is a medium-sized species, males attaining a carapace length of 17.8 mm. and females 17.1 mm.; the smallest ovigerous female seen has the carapace 8.1 mm. long.

Inasmuch as Milne Edwards and Bouvier confused the species with several others, it seems desirable to record the following stations at which the true *M. stimpsoni* was obtained: off the north coast of Cuba, stations 23 and 53 (?); off the south coast of Cuba, stations V and XXII; off Jamaica, stations IX and ?; off St. Croix, station 128; off Saba Bank, station 143; off St. Kitt, stations 148 and 149; off Guadeloupe, stations 159, 164, 167 and 172; off Dominica, stations 184, 186 and 191; off Martinique, station 193; off Grenadines, station 238; and off Grenada, stations 246 and 248.

Distribution. – The typical *M. stimpsoni* is so far known only from the West Indian region where it has been taken from the north coast of Cuba to the Lesser Antilles, as far south as Grenada, in depths of 94 to 490 fathoms.

Munida striata, sp. nov.

(Fig. 24)

Munida Stimpsoni A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 47 (part). Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 52 (part).

Holotype. – Ovigerous female, M. C. Z. No. 11512; off Playa Baracoa, Havana Province, Cuba; lat. 23° 05′ N., long. 82° 33′ W.; 260 fathoms; March 23, 1939; station 3,303.

Paratypes. – One male and one ovigerous female from station 3,320, 185 fathoms, and one ovigerous female from station 3,328, 260-275 fathoms; both of these stations are in Bahia de Cochinos on the south coast of Santa Clara Province, Cuba.

Another female was taken by "Atlantis" in 1938, probably off the north coast of Cuba, but the station data has been lost.

Among the "Blake" material in the Museum of Comparative Zoölogy are seven specimens belonging to this species, which were taken at the following stations:

Off St. Croix:

Station 128; 180 fathoms; 1 young.

Station 134; 248 fathoms; 1 young (cotype of *M. stimpsoni*).

Station 139; 218 fathoms; 1 male, 3 ovigerous females (1 female a cotype of *M. stimpsoni*).

Off Guadeloupe:

Station 164; 150 fathoms; 1 ovigerous female.

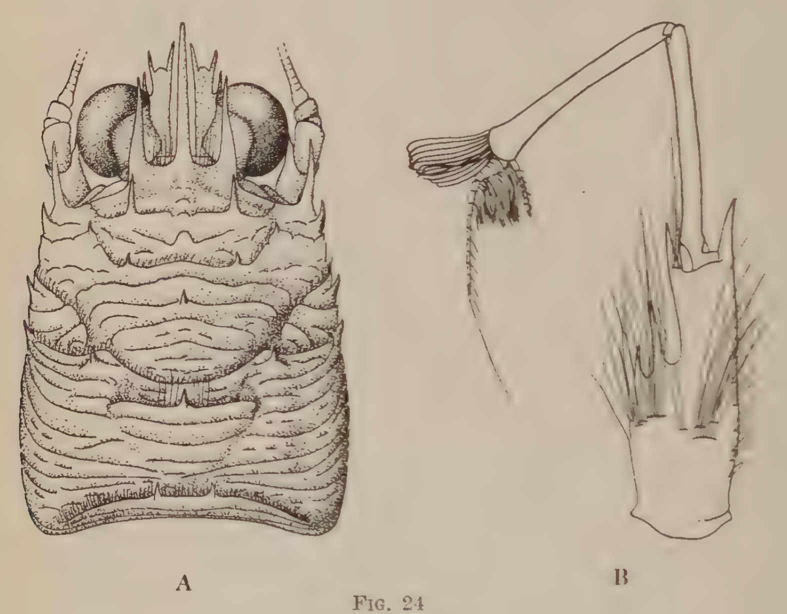


Fig. 24

Munida striata

Female holotype. – A. Carapace. × 3. – B. Right antennule from below. × 7½.

Description. – Carapace broadest posteriorly, ornamented with relatively few, sharply defined and nearly entire transverse striae and with several distinct spines. Rostral spine up to twice as long as supraocular spines; the latter extend beyond the eyes. Behind the supraocular spines is a pair of long spines, and a second pair of smaller ones directly behind these; there is a single median spine at the center of the gastric area and, rarely, a second median spine anterior to this between the anterior gastric pair; there is a small spine near the margin of each hepatic region; behind the cervical groove, there is a spine at the antero-internal angle of each branchial region on either side of the cardiac area, and a median spine on the cardiac region. The antero-lateral spines are long and slender and behind them are three much smaller lateral spines. Posterior margin armed with a single pair of spines.

Abdomen decorated with sharply defined striae. The second somite is armed anteriorly with three pairs of spines, the third somite with two pairs and the fourth somite with one anterior pair and a single spine in the midline near the posterior margin.

Thoracic sternum unarmed and smooth, except for the segment bearing the chelipeds, which has a few squamose markings.

Eyes of good size and semicircular, but not quite as large as those of *M. stimpsoni*; they are dark-brown in color.

Basal segment of antennular peduncle armed with two terminal spines, the inner one being the longer, and two outer lateral spines, of which the anterior is the longer. This segment is very similar to that in *M. stimpsoni* but is longer, reaching well beyond the eyes, due largely to the elongation of the distal constricted portion of the segment. Basal segment of antennal peduncle armed with two anterior spines, one inside and one outside of the articulation with the following joint.

Third maxillipeds as in *M. stimpsoni*, with a distal spine on the inner margin of the ischium and a single strong spine just behind the middle of the inner margin of the merus.

Chelipeds long and slender and almost identical with those of *M. stimpsoni*. Measured from the ischial fracture, they are from four to five times as long as the carapace to the base of the rostral spine.

The ambulatory legs are as in *M. stimpsoni*.

Measurements. – Both male specimens examined are of medium size, the largest having a carapace length of 12.8 mm. The largest female has the carapace 16.8 mm. long, and the smallest ovigerous female 10.4 mm. long.

Remarks. – Although *M. striata* is very closely allied to *M. stimpsoni*, its appearance is quite different, due to the relatively few, sharply defined transverse ciliated lines on the carapace. In *M. stimpsoni*, as may be seen in fig. 23, these striae are so numerous, broken up and covered by such a dense coat of fine hairs, that it would be almost impossible to count the individual lines. In addition to this obvious character, *M. striata* has the anterolateral spines of the carapace longer and more slender than in *M. stimpsoni*, the basal segment of the antennular peduncle longer and more slender and the sternum largely smooth on the last four somites, whereas in *M. stimpsoni* the sternum is covered with fine, irregularly placed striae. The sharply defined carapacic lines cause *M. striata* to resemble *M. evermanni*, but that species has these lines coarsely granulate, more than one pair of spines on the posterior margin of the carapace and a shorter and broader basal antennular segment.

Distribution.—Known only from the localities listed above, the north and south coasts of Cuba and off St. Croix and Guadeloupe in from 150 to 260 fathoms.

MUNIDA EVERMANNI Benedict

(Fig. 25)

Munida Stimpsoni A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 47 (part). Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 52 (part).

Munida evermanni Benedict, 1901, Bull. U. S. Fish Comm. for 1900, vol. 20, pt. 2, p. 146, pl. 5, fig. 4. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 252.

Occurrence.

North coast of Cuba:

Off Bahia de Matanzas, Matanzas Province; station 3,467; 215 fathoms; 1 young; station 3,482; 190 fathoms; 1 ovigerous female.

Off Caibarién, Santa Clara Province; station 3,421; 235 fathoms; 1 male; station 3,422; 235 fathoms; 3 males, 4 females, 2 of which are ovigerous, 1 young; station 3,423; 245 fathoms; 32 males, 4 of which are soft-shelled, 15 females, 13 of which are ovigerous; station 3,425; 250 fathoms; 8 males, 6 ovigerous females; station 3,427; 240 fathoms; 2 ovigerous females; station 3,428; 240 fathoms; 15 males, 1 of which is paper-shelled, 17 females, 16 of which are ovigerous; station 3,430; 235 fathoms; 2 males, 1 female; station 3,431; 245 fathoms; 4 males, 2 females, 2 young; station 3,432; 250 fathoms; 3 males, 3 females, 2 young; station 3,434; 260 fathoms; 3 males, 4 females, 1 young; station 3,435; 255 fathoms; 7 males, 4 females, 2 young; station 3,436; 255 fathoms; 4 males, 1 of which is paper-shelled, 1 female; station 3,437; 260 fathoms; 7 males, 2 females.

Old Bahama Channel off Punta Alegre, Camagüey Province; station 2,891C; 195 fathoms; 1 female; station 2,981D; 190-230 fathoms; 1 male; station 2,982; 210 fathoms; 12 males, 13 females, 9 of which are ovigerous, 1 young (1 male and 1 ovigerous female with branchial parasites); station 2,982A; 210 fathoms; 9 males, 3 females, 1 of which is ovigerous; station 2,982B; 205-230 fathoms; 1 male; station 2,982D; 150-180 fathoms; 2 males; station 3,411; 260 fathoms; 4 males,

4 ovigerous females; station 3,412; 235 fathoms; 6 males, 3 ovigerous females.

Old Bahama Channel off Cayo Coco, Camagüey Province; station 3,404; 215 fathoms; 2 females, 1 of which is ovigerous; station 3,405; 235 fathoms; 1 male, 1 ovigerous female.



Fig. 25

Munida evermanni

Right antennule of male from "Atlantis" station 3,405, from above. × 10.

Remarks.—This species closely resembles *M. affinis*, due to the granulated striae on the carapace, but it is a somewhat larger species, males reaching a carapace length of 20.3 mm. and females 18.9 mm.; one ovigerous female has a carapace length of only 6.9 mm., but this is almost certainly abnormal as none of the other ovigerous specimens have the carapace less than 14.2 mm. long. *M. evermanni* may be distinguished from *M. affinis* by the minutely beaded, rather than

spinose, transverse striae on the carapace; by the smaller number of spines, 2 to 6 rather than 6 to 15, on the posterior margin of the carapace; by the absence of marginal spines on the sternum; and by the much shorter lateral spines on the first joint of the antennular peduncle.

Thirteen specimens of this species have been found among the "Blake" material in the Museum of Comparative Zoölogy. They were taken at the following localities:

Off St. Kitts; station 148, 208 fathoms; 1 male.

Off Martinique; station 206; 170 fathoms; 2 males, 1 ovigerous female (cotypes of *M. stimpsoni*).

Off St. Lucia; station 219; 151 fathoms; 2 ovigerous females (1 is a cotype of *M. stimpsoni*).

Off Cannouan, Grenadines; station 238; 127 fathoms; 2 males, 1 ovigerous female.

Off Grenada; station 248; 161 fathoms; 1 male, 2 females, 1 of which is ovigerous.

Off Grenada; station 263; 159 fathoms; 1 ovigerous female.

Distribution. – These records from the north coast of Cuba and the Lesser Antilles from St. Kitts to Grenada constitute the first ones for the species since the types were taken off Mayaguez Harbor, Puerto Rico. The bathymetric range is seen to be from 151 to 260 fathoms.

Munida benedicti, sp. nov.

(Fig. 26)

Munida stimpsoni A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 47 (part). Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 52 (part). Benedict, 1901, Bull. U. S. Fish Comm. for 1900, vol. 20, pt. 2, p. 147 (part). Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 252.

Holotype. – Ovigerous female, M. C. Z. No. 11517; off Cayo Coco, Camagüey Province, Cuba; lat. 22° 34′ N., long. 78° 15′ W.; 180 fathoms; April 28, 1939; station 3,396.

Paratypes. – In addition to the type, 1 male, 2 females and 1 intersex were taken at station 3,396. Two other specimens were taken off Cayo Coco, 1 female at station 3,391, 220 fathoms, and 1 male at station 3,401, 235 fathoms.

This species, like *M. striata*, was confused with *M. stimpsoni* by Milne Edwards and Bouvier; it was taken by the "Blake" at the

following stations, as verified from material in the Museum of Comparative Zoölogy:

Off Saba Bank; station 143; 150 fathoms; 1 ovigerous female (cotype of *M. stimpsoni*).

Off St. Kitts; station 149; 60-150 fathoms; 3 males, 3 females, 2 of which are ovigerous.

Off Guadeloupe; station 164; 150 fathoms; 2 males.

Off Martinique; station 203; 96 fathoms; 1 female (cotype of *M. stimpsoni*).

Off St. Vincent; station 231; 95 fathoms; 1 male (cotype of *M. stimpsoni*).

Off Grenada; station 248; 161 fathoms; 1 young.

Description. – Carapace broadest posteriorly, with well separated and well marked, nearly entire, transverse lines. Rostral spine long, often more than twice as long as supraocular spines which extend as far as, or slightly beyond, eyes. There are two pairs of spines behind the supraoculars, one behind the other; usually there is no median spine on the gastric region, although one specimen has a minute denticle on the center of this area; a single spine near the margin of each hepatic area; there may be one or two spines on each triangular area between the branches of the cervical groove; one spine on the antero-internal portion of each branchial area behind the cervical groove; and a median spine on the cardiac region. The anterolateral spines are long and slender, each one followed by three or four small lateral spines. The posterior margin is armed with a single pair of spines.

On the abdomen, the transverse striae are sharply defined. The second somite is armed anteriorly with three pairs of spines, the third somite with two pairs and the fourth somite with a single pair. There is no median posterior spine on the fourth somite.

The sternum is unarmed along the margins, and the surface is largely smooth except for the usual intersegmental ridges.

The eyes are very large, semicircular and flattened dorso-ventrally.

Basal segment of antennular peduncle armed with two terminal spines, the inner of which is slightly the longer, and two rather small lateral spines, the anterior the longer. The proportions of this appendage are very much as in *M. stimpsoni*, but the lateral spines are slightly shorter than in that species. The basal segment of the antennal peduncle has two distal spines, one on either side of the articulation with the following segment.

Third maxillipeds as in *M. stimpsoni* with an inner distal spine on the ischium and a spine near the middle of the inner margin of the merus.

Chelipeds very long and slender; measured from the ischial fracture, they are five, or more than five times the length of the carapace to the base of the rostral spine. They are similar to those of *M. stimpsoni*, except that in the males examined the chela is noticeably broadened at the base of the fingers to form a gape between them at that point.



Fig. 26

Munida benedicti. Holotype. × 2.

Measurements. – This is not a large species. The largest male examined has the carapace 10.8 mm. long and the largest female 10.6 mm.; the smallest of the ovigerous females has a carapace length of 7.6 mm.

Remarks. – Although readily confused with *M. stimpsoni* at first glance, *M. benedicti* is apparently a smaller species and it may be easily distinguished by the absence of a median posterior spine on the fourth abdominal somite, the absence of a median gastric spine and the less numerous and more sharply marked transverse striae on the carapace. It is perhaps most closely related to *M. flinti*, but in that species there is a median posterior spine on the fourth abdominal somite, more numerous transverse striae on the abdominal somites and shorter supraocular spines.

Distribution. – Known from the north coast of Cuba and the Lesser Antilles as far south as Grenada in depths of 95 to 235 fathoms.

Genus *Munidopsis* Whiteaves, 1874.

Since the genus *Munidopsis*, as generally recognized by modern authors, now contains about 115 species, a serious attempt was made to split up this unwieldy group into genera or subgenera which could be more or less easily defined. Unfortunately, this study not only failed to reveal any natural grouping, but it showed that the subgenera *Galathodes*, *Elasmonotus*, *Orophorhynchus* and *Bathyankyristes*, which have been frequently employed by other authors, are practically indefinable and that even the genus *Galacantha*, which has been generally considered worthy of separate status, must be merged with *Munidopsis*.

Admittedly, the typical forms of *Galacantha* (*G. diomedeae*, *G. rostrata*, *G. spinosa*, *G. trachynotus* and *G. valdiviae*) are readily recognizable by the abnormal development of dorsal spines on the carapace, but two species of *Munidopsis* (*M. expansa* and *M. gilli*), described by Benedict in 1902, and the new species (*M. cubensis*) described below, show that the peculiar form of the rostrum on which Milne Edwards and Bouvier laid such importante is not a reliable character, and Ortmann's *G. camelus* apparently forms another intermediate step between the two genera, even closer to *Munidopsis* than the three West Indian forms.

As an alternative, it was hoped that a natural distinction between the two genera could be based on the presence or absence of epipods on the ambulatory legs. It has been possible, through the

relatively large collection of *Munidopsis* in the Museum of Comparative Zoölogy, as well as from specimens very kindly loaned or personally examined by Dr. Waldo L. Schmitt of the United States National Museum, and also through the literature, to determine the arrangement of epipods in 95 species of the genus. Curiously enough, in all species examined, epipods were either large and well developed on an appendage or absent entirely. Of these 95 species, 61 have no trace of an epipod on the chelipeds or ambulatory legs, 19 have them on the chelipeds but not on any of the ambulatory legs, one (*M. expansa*) has them on the first pair of ambulatory legs as well as on the chelipeds, 13 have them on the chelipeds and first two pairs of ambulatory legs and one (*M. hemingi*) has them on all three pairs of ambulatory legs as well as on the chelipeds. Inasmuch as the one species which has epipods only on the chelipeds and first pair of ambulatory legs is obviously closely related to the typical species of *Galacantha*, it might be supposed that the presence or absence of epipods on the ambulatory legs would serve to define the genera *Galacantha* and *Munidopsis*, respectively. However, the futility of such a distinction is illustrated by a comparison between two such species as *M. abbreviata*, which has epipods on the chelipeds and first two pairs of ambulatory legs, and *M. curvirostra*, which lacks epipods entirely behind the maxillipeds; aside from the somewhat more robust form and shorter rostrum of the former species and slight differences in the armature of the carapace, these two species differ from each other very little and none of the diagnostic characters could be considered of more than specific importance.

Milne Edwards and Bouvier (1894) have attempted to show that differences in general form, such as the form of the rostrum in *Galacantha* and *Galathodes*, the absence of lateral armature on the carapace in *Elasmonotus* and the robust form and short chelipeds in *Orophorhynchus*, are of greater generic importance in the Galatheidae than are differences that are usually considered of a more fundamental nature in other group. If an attempt was made to split the genus on this basis, we might recognize the genus *Galacantha*, characterized by the presence of abnormal spines on the carapace, containing five species; the genus *Galathodes*, almost as sharply defined on the basis of the flat, tridentate rostrum and slightly armored carapace, represented by about 12 or 13 species grouped around *Munidopsis* latifrons; the genus *Orophorhynchus*, containing about a dozen robust and short-clawed species like *Munidopsis aries;* the

genus *Elasmonotus*, with another five or six species with rounded anterolateral angles and strongly carinate abdominal somites as in *Munidopsis longimana;* possibly *Anoplonotus*, to be resurrected for forms near *Munidopsis polita*, such as *M. espinis*, *M. inermis* and *M. marionis;* and *Bathyankyristes* for the two Indian species in which the propodi of the ambulatory legs are more or less broadened to form subchelate appendages. This would leave a large residue of variously related forms to remain in the genus *Munidopsis*, proper. If the groups listed above are recognized as genera, it would seem desirable to erect the following additional similar groupings: one containing some eight or ten rather large species grouped around *M. subsquamosa* in which the eyes are movable and armed; one for the small group of about four species having the rostrum peculiarly tridentate as in *M. erinacea:* another for a group of like size for the species allied to *M. robusta;* one containing the two species *M. spinoculata* and *M. hendersoniana*, in which the huge terminal spine of the eyestalk practically passes through the cornea; a fairly well defined group of ten or more species having the rostrum sharply carinate dorsally and the eyestalks provided with a flat, curved spine bent over the surface of the cornea as in *M. serratifrons;* and finally one for the two species described by Balss, *M. subchelata* and *M. hirsutissima*, in which the cornea is terminal on the eyestalk, but is so small that the latter is little more than a long triangular spine. Even after these twelve groups are erected, they would include little more than two-thirds of the old genus *Munidopsis*. Some of the remaining 50 or 55 species are so unique that they would probably be placed in monotypic genera: *M. abdominalis* has the carapace peculiarly formed and the third maxillipeds distinctly armed; *M. armata* has curious submarginal gutters on the carapace and the rostrum of a unique form; *M. aspera* is covered with tuberculous granules and has a peculiar lamellate tooth behind the antenna; and *M. squamosa*—and also *M. barbarae*—has the eyes and antennal peduncles fused with the carapace. The remaining species would be extremely difficult to place correctly, and many of them would form intermediate links that would make the limits of many of the groups so uncertain as to defy definition.

Eventually, it is very possible that the genus will be divided up into many genera or subgenera in some such manner as that outlined above, but it is hazardous to attempt such a division at present when probably not more than half of the existing species of *Munidopsis* are known and relationships are consequently obscure. In any event,

I do not believe that an arrangement of the species into four or five groups, as proposed by Milne Edwards and Bouvier serves any useful purpose and it may tend to obscure natural lines of descent. Smith (1884) was probably correct in uniting *Galacantha* with *Munidopsis*, although his proposal was scorned at the time, and Faxon's discussion of the whole problem (1895, pp. 81-83) applies nearly as well today as it did when written.

Of the 120 species of *Munidopsis*—more or less, dependent on the number that must be synonymized—38 are known from the western Atlantic. All but six of these 38 have been available for study in the collections of the Museum of Comparative Zoölogy, 25 of them represented by type material, and four of the remaining six have been loaned for study by the Secretary of the United States National Museum.

Check lists of the species of the world may be found in Benedict (Proc. U. S. Nat. Mus., vol. 26, no. 1311, 1902, pp. 304 & 315) and in Doflein and Balss (Wiss. Ergebn. deutsch. Tiefsee-Exped. (Valdivia), Bd. 20, Lf. 3, 1913, p. 174). No species from outside of the western Atlantic have been described since publication of the latter list.

KEY TO THE WESTERN ATLANTIC SPECIES OF THE GENUS *MUNIDOPSIS*

1. Epipods present on chelipeds, at least 2
   No epipods on chelipeds or ambulatory legs 16
2. Epipods on chelipeds and first two pairs of ambulatory legs 3
   No epipods on second pair of ambulatory legs 10
3. A huge, laterally compressed spine extending upward from gastric region of carapace 4
   No abnormally large spine on dorsal surface of carapace 5
4. Rostrum armed with a pair of distinct lateral teeth at end of horizontal portion .... *M. rostrata* (p. 75)
   Rostrum laterally unarmed .... *M. spinosa* (p. 76)
5. Eyestalks cylindrical, movable and unarmed 6
   Eyestalks very short and broad and immovably fused to surrounding regions 8
6. Rostrum strongly upturned in distal half with pair of lateral spines at end of horizontal portion 7
   Rostrum little upturned and unarmed .... *M. abbreviata* (p. 77)
7. Abdomen armed with a single median spine on second, third and fourth somites .... *M. gilli* Benedict, 1902.
   Abdomen armed with two median spines on second somite and one on third; fourth somite unarmed .... *M. cubensis* (p. 78)

8. Eyestalks unarmed ....*M. espinis* (p. 80)
Eyestalks armed with one or more teeth.................................. 9
9. Dorsal surface of carapace at most sharply granulate................
..........................*M. squamosa* (A. Milne Edwards, 1880)
Dorsal surface of carapace covered with regularly arranged short, sharp spines ....*M. barbarae* (p. 81)
10. Epipods on first pair of ambulatory legs; rostrum strongly upturned in distal half and armed with pair of lateral spines at end of horizontal portion ....*M. expansa* (p. 81)
No epipods on ambulatory legs.. 11
11. Eyestalks armed with one or more teeth or spines which extend beyond cornea 12
Eyestalks unarmed 15
12. A single inner spine or tooth on eyestalk.......................... 13
A short spine on outer side of cornea as well as a long one on inner side..........................*M. nitida* (A. Milne Edwards, 1880)
13. Body not covered with dense pubescence; frontal margin of carapace between base of rostrum and anterolateral spine practically unarmed 14
Body and appendages covered with short, dense pubescence which conceals surface beneath; frontal margin of carapace with a well marked tooth behind base of antenna.................*M. bermudezi* (p. 83)
14. Anterior part of dorsal surface of carapace armed with several small spines in addition to the gastric pair; chelipeds but little longer than carapace and rostrum ....*M. crassa* Smith, 1885.
Only spines on dorsal surface of carapace are pair on gastric region; chelipeds fully once and two-thirds as long as carapace and rostrum..
.....................................*M. similis* Smith, 1885.(1)
15. Rostrum a simple spine; posterior margin of carapace armed with from 1 to 5 spines..................................*M. sigsbei* (p. 82)
Rostrum broad, flat and tridentate; posterior margin of carapace unarmed ....*M. acuminata* Benedict, 1902.
16. Eye spines present 17
No tooth or spine arising from eyestalk or cornea.................. 22
17. Ridge along posterior margin of carapace bearing spines........... 18
Posterior margin of carapace unarmed.............................. 21
18. Rostrum a long, slender spine irregularly armed with a few lateral spines ....*M. bairdii* (Smith, 1884).
Rostrum not armed with lateral spines.............................. 19
19. Abdomen armed with spines on second, third and fourth somites......
....*M. serratifrons* (p. 85)
Abdomen unarmed 20

(1) As no specimens of *M. similis* have been available for examination, it has been impossible to determine whether that species is but a variety of *M. crassa* as was suggested by Smith. Benedict (1902, p. 276) attributes two eyespines to this species as in *M. nitida*, but he fails to mention this important character elsewhere.

20. Merus of third maxilliped armed on inner margin with four or more irregular denticles..........*M. reynoldsi* (A. Milne Edwards, 1880).
Merus of third maxillipeds with two long spines on inner margin..... ....*M. sharreri* (A. Milne Edwards, 1880).
21. Eyestalks armed with a short tooth at inner side of cornea........... ....*M. aries* (A. Milne Edwards, 1880).
A stout spine arising from center of cornea proper. *M. spinoculata* (p. 86)
22. Rostrum either armed with strong lateral spines or teeth or abruptly constricted in its distal portion to form a pair of blunt teeth.... 23
Rostrum laterally unarmed, at most minutely serrate, usually more or less triangular or spine-like.................................... 30
23. Rostrum broad and flat with more or less subparallel margins in its basal portion and ending in a trident......................... 24(2)
Rostrum not broadly tridentate.................................... 28
24. A pair of spines on anterior gastric region. ....*M. tridens* (p. 87)
No dorsal spines on carapace...................................... 25
25. A submarginal spine on pleuron of second abdominal somite......... ....*M. latifrons* (p. 87)
Abdomen completely unarmed 26
26. Rostrum comparatively narrow.........*M. tenuirostris* Benedict, 1902.
Rostrum broad 27
27. Chelipeds and ambulatory legs moderately slender. *M. tridentata* (p. 88)
Chelipeds and ambulatory legs robust.........*M. bahamensis* (p. 89)
28. Rostrum constricted in distal portion to form a pair of obtuse teeth; carapace and abdomen dorsally unarmed.........*M. armata* (p. 90)
Rostrum armed with a pair of sharp lateral spines; carapace and second, third and fourth abdominal somites armed with regularly placed sharp spines 29
29. Posterior margin of carapace unarmed...........*M. erinacea* (p. 90)
Ridge along posterior margin of carapace armed with from four to eight spines ....*M. spinifer* (p. 91)
30. Abdomen either armed with a median spine or tooth on second and third somites, or carinae on those somites are produced dorsally into broad, laminate lobes 31
Abdomen unarmed and not abnormally carinate....................... 36
31. A sharp median spine on second and third abdominal somites; rostrum either spine-like or thick and simply triangular..................... 32
Carinae of second and third abdominal somites more or less strongly produced dorsally, often with a median tooth or tubercle, but no sharp spine; rostrum broad and hood-like, strongly excavate dorsally..... 34
32. Frontal margin of carapace with triangular denticulate lobe behind base of antenna; blunt median tooth on posterior margin........... ....*M. robusta* (A. Milne Edwards, 1880).
Frontal and posterior margins of carapace unarmed................. 33

(2) The species having tridentate rostra, belonging to the old subgenus *Galathodes*, are so closely related to each other that it is extremely difficult to construct a satisfactory key for their identification. The reader is therefore cautioned to refer to the original descriptions of the species of this group.

33. Rostrum more than two-thirds as long as remainder of carapace and strongly upcurved; antennal peduncle unarmed.. *M. curvirostra* Whiteaves, 1874.
Rostrum about one-half as long as remainder of carapace and less strongly upcurved; antennal peduncle spinose...... *M. simplex* (p. 92)
34. Dorsal surface of carapace rather strongly arched transversely, the raised portions coarsely tuberculate or scabrous. *M. riveroi* (p. 93)
Dorsal surface of carapace not strongly convex, the raised portions only moderately tuberculate or granulate.............................. 35
35. Chelipeds rather long and slender; lateral margins of carapace subparallel .... *M. longimana* (p. 95)
Chelipeds shorter and stouter; lateral margins of carapace convex.... .... *M. brevimana* (p. 96)
36. Two small spines on anterior gastric region...................... .... *M. platirostris* (A. Milne Edwards & Bouvier, 1894).
Carapace unarmed dorsally 37
37. Merus of third maxillipeds armed with long spines.................. .... *M. abdominalis* (p. 98)
Merus of third maxillipeds armed with low, blunt teeth............. .... *M. polita* (Smith, 1883).

MUNIDOPSIS ROSTRATA (A. Milne Edwards)

Galacantha rostrata A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 52. Smith 1882, Bull. Mus. Comp. Zoöl. Harv., vol. 10, no. 1, p. 21, pl. 9, fig. 2, 2a. Smith, 1884, Rep. U. S. Comm. Fish. for 1882, p. 355. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 271. Faxon, 1895, Mem. Mus. Comp. Zoöl. Harv., vol. 18, p. 78, pl. B, figs. 1, 1a. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 60, pl. 4, figs. 21-24. Milne Edwards & Bouvier, 1900, Expéd. Sci. "Travailleur" et "Talisman", Crust. Déc., pt. 1, p. 308, pl. 6, fig. 9. Alcock, 1901, Cat. Indian Deep-sea Crust., p. 275. Stebbing, 1908, Ann. S. Afr. Mus., vol. 6, p. 20.

Munidopsis rostrata Smith, 1885, Proc. U. S. Nat. Mus., vol. 7, no. 32, p. 493. Smith, 1886, Rep. U. S. Comm. Fish. for 1885, pt. 13, no. 21, p. 45, pl. 6, figs. 1, 1a.

Galacantha Talismani Filhol, 1885, La Vie au Fond des Mers, pl. 3. Perrier, 1886, Les Explorations Sous-Marines, text-fig. 242 (8), p. 341.

Galacantha talismanii Henderson, 1888, Rep. Sci. Res. H. M. S. Challenger. Zoology, vol. 27 (pt. 69) p. 167, pl. 20, fig. 1.

Galacantha bellis Henderson, 1885, Ann. Mag. Nat. Hist., ser. 5, vol. 16, no. 96, p. 413. Henderson, 1888, Rep. Sci. Res. H. M. S. Challenger. Zoology, vol. 27 (pt. 69) p. 167, pl. 19, fig. 6.

Galacantha areolata Wood-Mason & Alcock, 1891, Ann. Mag. Nat. Hist., ser. 6, vol. 7, p. 200. Alcock & Anderson, 1894, J. Asiat. Soc. Beng., vol. 63, pt. 2, no. 3, p. 173. Ill. Zool. Investigator, Crust., 1901, pl. 55, figs. 5, 5a. (= *G. rostrata*).

Galacantha investigatoris Alcock & Anderson, 1894, J. Asiat. Soc. Beng., vol. 63, pt. 2, no. 3, p. 173. Ill. Zool. Investigator, Crust., 1895, pl. 12, fig. 4.
Galacantha rostrata var. *Investigatoris* Alcock, 1901, Cat. Indian Deep-sea Crust., p. 276.
Galacantha faxoni Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 304.

Occurrence.

South coast of Cuba:

Windward Passage, south of Oriente Province; station 2,970; 1600-1800 fathoms; 1 male.

Remarks. – As Stebbing (1908) has pointed out, some authors will probably continue to split this species, as recognized here, into several varieties or even distinct species; but, on the evidence in the literature, I can find no excuse for such a move at the present time, and therefore agree with Faxon and Stebbing that *M. rostrata* appears to be a slightly variable species with a very wide-spread distribution. The specimens from off the Galapagos Islands in the Museum of Comparative Zoölogy, which Benedict called *Galacantha faxoni*, display no apparently constant characters by which they can be separated from the Atlantic species. Possibly a comparative examination of the 35 or 40 specimens known from all parts of the worlds would reveal minute distinctions by which valid races might be recognized, but it is probable that when additional material is found, these forms will all tend to merge into one variable species.

Distribution. – In the western Atlantic from off New Jersey to Bequia in the Lesser Antilles; in the eastern Atlantic off Morocco; off Cape Point, South Africa; the Arabian Sea and Bay of Bengal; off the Banda Islands in the Moluccas; and in the eastern Pacific off the Galapagos Islands and off Valparaiso, Chile. The bathymetric range is from 900 to 1591 fathoms.

MUNIDOPSIS SPINOSA (A. Milne Edwards)

Galacantha spinosa A. Milne Edwards, 1880, Bull. Mus. Comp. Zool. Harv., vol. 8, no. 1, p. 53. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 270. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 56, pl. 4, figs. 14-20.

Occurrence.

North coast of Cuba:

Off Bahia de Cárdenas, Matanzas Province; station 3,474; 490 fathoms; 1 female.

Nicholas Channel off Bahia de Santa Clara, Santa Clara Province; station 2,991; 475 fathoms; 1 female with a branchial parasite; station 3,457; 550 fathoms; 1 male.

South coast of Cuba:

Bahia de Corrientes, Pinar del Río Province; station 3,314; 500 fathoms; 1 young.

Remarks. – Although *M. diomedeae* from American Pacific waters and *M. trachynotus* from the Arabian Sea are closely allied to this species, I cannot agree with Stebbing (1908) that the Indian form should be synonymized with *M. spinosa*. Apparently that author overlooked the fact that in the typical *M. spinosa* the rostrum is totally devoid of lateral spines. These three species are seldom found in depths below 1,000 fathoms, whereas *M. rostrata* is usually encountered in greater depths; this may have some bearing on the fact that they show specific morphological characters in different parts of the world, whereas *M. rostrata* has undergone practically no change in spreading over a similar range.

Distribution. – *M. spinosa* was previously known only from two specimens taken by the "Blake" off Dominica in 333 fathoms.

MUNIDOPSIS ABBREVIATA (A. Milne Edwards)

Galathodes abbreviatus A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 55.

Munidopsis abbreviata Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 275. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 91, pl. 5, fig. 1. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 277.

Occurrence.

North coast of Cuba:

Off Bahia de Cárdenas, Matanzas Province; station 2,996; 470-665 fathoms; 1 male.

Off Bahia de Santa Clara, Santa Clara Province; station 3,454; 600 fathoms; 1 female.

Remarks. – These specimens are much larger than any of the three "Blake" specimens in the Museum of Comparative Zoölogy, but they agree with them in all essential characters. The male has a carapace length of 25 mm. to the base of the rostrum, and the female has the carapace 21 mm. long. The largest of the "Blake" females examined has a carapace length of only 11 mm. and the form

of the abdominal appendages indicates that all three of them were immature.

Distribution. – Previously known only from the "Blake" specimens which were taken off Martinique and Guadeloupe in depths of 501 to 734 fathoms.

Munidopsis cubensis, sp. nov.

(Figs. 27, 28)

Holotype. – Male, M. C. Z. No. 11731; northwest of Puerto Cayo Moa, Oriente Province, Cuba; lat. 20° 46′ N., long. 74° 59′ W.; 625 fathoms; April 19, 1939; station 3,366.

Description. – Carapace, from the base of the rostrum, distinctly longer than broad. The dorsal surface is considerably vaulted transversely and broken up into three distinct elevations by two broad transverse grooves. On the anterior gastric region there is a single pair of well marked spines, but elsewhere the dorsal surface is merely rugose and granulate. The frontal margin is unarmed. Laterally, the carapace is armed with three pairs of spines, the largest at the anterolateral angle, a slightly smaller one behind the anterior branch of the cervical groove and a very small one behind the posterior branch of this groove. The ridge bordering the posterior margin bears a minute and insignificant pair of denticles near the midline. Rostrum strongly upturned in its distal half as in the old genus *Galacantha* and armed with a pair of spines at the end of the broader horizontal basal portion.

Abdomen with three median spines, one on the anterior ridge of the second somite, a small one on the posterior ridge of that somite and a third, about equal in size to the first, on the anterior ridge of the third somite. There is a single anterior transverse ridge on the fourth somite, but there are none posterior to this.

Sternum unarmed and smooth, but with the intersegmental ridges high and sharp.

Eyes colorless, unarmed and movable.

Basal segment of antennular peduncle swollen, unarmed internally, but with two strong, subequal spines outside of the articulation with the following segment.

Third maxillipeds with the anterior angles of the ischium produced forward and outward, and the merus armed with two broad spines on the inner margin and a spine at the outer distal angle.

Chelipeds less than twice as long as the carapace to the base of the rostrum and not very robust. The fingers end in strongly dentate, spoon-shaped tips.

Ambulatory legs stout and rugose with terminal spines on the meral and carpal joints. The dactyls have about ten small teeth on their lower margins.

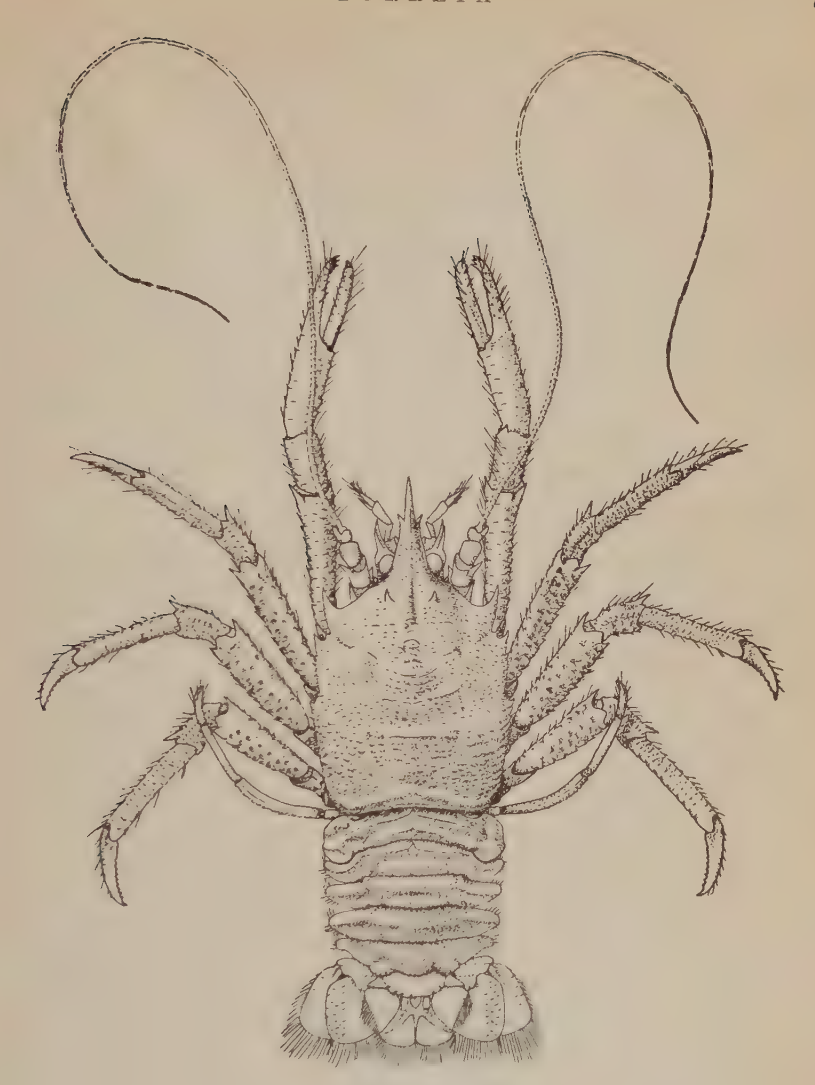


FIG. 27

Munidopsis cubensis. Holotype. × 1½.

Epipods are present on the chelipeds and first two pairs of ambulatory legs.

Measurements. – The unique holotype is about 51 mm. in total length. The carapace, to the base of the rostrum is 20 mm. long.

Remarks. – There is little difficulty in distinguishing this species from all previously described forms. Apparently only two other spec-

ies, *M. expansa* and *M. gilli*, have a similar Galacantha-like rostrum which is armed laterally and not associated with any abnormal dorsal armature on the carapace. From the first, *M. cubensis* differs in having spines on the gastric region and on the abdomen, having distinct teeth on the inner margin of the merus of the third maxillipeds and in having the meri of the ambulatory legs terminating in spines. From *M. gilli* it is distinguished by the smaller, forwardly directed lateral spines on the carapace, less prominent tubercles on the dorsal surface of the carapace, two rather than three spines on the inner margin of the merus of the third maxillipeds and no median spine on the fourth abdominal somite.

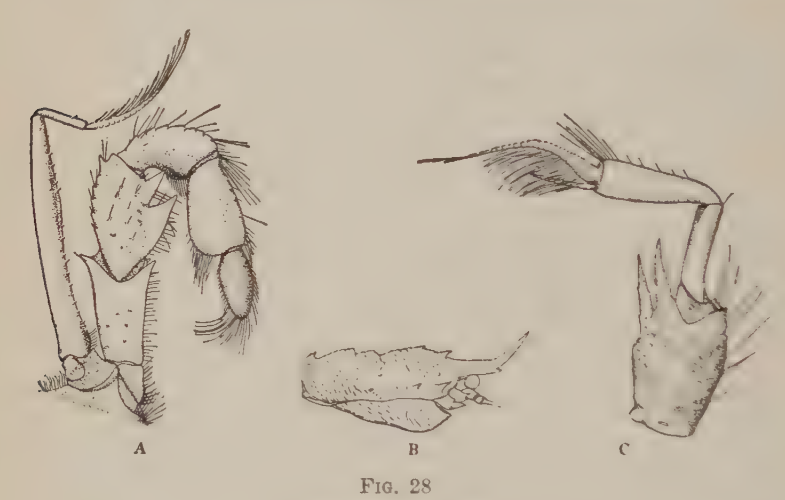


FIG. 28

Munidopsis cubensis

Holotype. – A posterior view of right third maxilliped. × 5. – B. Lateral view of carapace. × 1. – C. Ventral view of right antennule. × 5.

MUNIDOPSIS ESPINIS Benedict

Munidopsis espinis Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 282, text-fig. 25.

Occurrence.

North coast of Cuba:

Off Bahia de Cárdenas, Matanzas Province; station 3,747; 490 fathoms; 1 male.

Remarks. – This specimen is very slightly larger than Benedict's type, the carapace measuring 9.1 mm. in length. It differs from the

statement given in Benedict's key in having the carapace obscurely rugose rather than smooth and punctate, and from his description and figure in having the anterolateral tooth on the carapace slightly broader and not reaching as far forward and in not having the lateral lobe behind this tooth double-pointed; there is no doubt, however, but that it belongs to the same species. The merus of the external maxillipeds is armed on the inner margin with two teeth, the anterior of which is bifid, and the basal segment of the antennule has a stout spine outside of the articulation with the following joint.

Distribution. – Previously known only from the type taken off Yucatán in 426 fathoms.

MUNIDOPSIS BARBARAE (Boone)

Galacantha barbarae Boone, 1927, Bull. Bingham Oceanogr. Coll., vol. 1, art. 2, p. 66, text-fig. 13.

This species was not obtained by the "Atlantis" Expedition, but there is a single intersex with an abdominal parasite in the Museum of Comparative Zoölogy which I have referred to it; it was taken by the "Blake" in 1877-78 in the Gulf of Mexico at 25° 33′ N., 84° 21′ W., 101 fathoms, station 45. This specimen is even smaller than the type, the carapace and rostrum measuring only 6 mm. in length, and it does not entirely agree with Miss Boone's description and figure as regards the armature of the carapace. The second row of gastric spines is made up of six rather than eight spines, the third row consists of four spines in a nearly transverse row rather than six in an anteriorly convex row, there are only 10 rather than 15 spines in the row just behind the cervical groove, the lateral spines are less prominent and outstanding and there are only nine or ten spines rather than eighteen on the posterior margin. As the specimen seems to agree with the type in all other particulars, probably not a great deal of importance should be given to the arrangement of the spines on the carapace.

The type, and only previously recorded specimen, was taken by the "Pawnee I" at Green Cay, Bahamas in an undisclosed depth.

MUNIDOPSIS EXPANSA Benedict

Munidopsis expansa Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 282, text-fig. 26.

Occurrence.

North coast of Cuba:

Off Playa Baracoa, Havana Province; station 3.306; 330 fathoms; 1 ovigerous female.

Off Bahia de Cárdenas, Matanzas Province; station 2.995; 370-605 fathoms; 1 male.

Remarks.—Although slightly smaller than the type, these specimens agree perfectly with Benedict's description and figure. The carapace of the ovigerous female measures 17.7 mm. to the base of the rostrum, and of the male 15.1 mm.; the latter lacks the lateral fringe of colored setae on the telson which is characteristic of adult males of most species of the genus, so this specimen may be immature.

Distribution.—The type, and only previously recorded specimen, was taken east of northern Florida in 421 fathoms.

Munidopsis sigsbēi (A. Milne Edwards)

Galathodes Sigsbei A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 56.

Munidopsis sigsbei Henderson, 1888, Rep. Sci. Res. H. M. S. Challenger. Zoology, vol. 27 (pt. 69), p. 150, pl. 18, fig. 2. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 275. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 83, pl. 5, figs. 8-26. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 276.

Occurrence.

North coast of Cuba:

Off Bahia de Cárdenas, Matanzas Province; station 2,994; 565-585 fathoms; 1 male, 1 ovigerous female; station 2,995; 370-605 fathoms; 6 males, 3 females, 2 of which are ovigerous; station 2,996; 470-665 fathoms; 9 males, 1 of which is soft-shelled, 6 females, 4 of which are ovigerous.

Nicholas Channel off Bahia de Santa Clara, Santa Clara Province; station 2,991; 475 fathoms; 1 male; station 2,991A; 475 fathoms; 1 male; station 2,993; 580 fathoms; 1 ovigerous female; station 3,456; 575 fathoms; 1 male.

Northwest of Puerto Cayo Moa, Oriente Province; station 3,367; 640 fathoms; 1 female.

North of Baracoa, Oriente Province; station 3,358; 975 fathoms; 1 male.

Remarks.–In addition to the localities listed by Milne Edwards and Bouvier, *M. sigsbei* was taken by the "Blake" off Grenada at station 265 in 576 fathoms in 1878-1879 and south of Jamaica at station VII in 610 fathoms in 1880.

Distribution. – Gulf of Mexico and Yucatán Bank, north coast of Cuba, south of Jamaica and the Lesser Antilles from Sombrero and St. Croix to Grenada in depths of 450 to 975 fathoms.

Munidopsis bermudezi Chace

(Figs. 29, 30)

Munidopsis bermudezi Chace, 1939, Mem. Soc. Cubana Hist. Nat., vol. 13, no. 1, p. 46.

Occurrence.

North coast of Cuba:

North of Gibara, Oriente Province; station 2,976; 1450 fathoms; 1 female (paratype).

South coast of Cuba:

Off Bahia de Guantánamo, Oriente Province; station 2,976B; 1330-1650 fathoms; 1 ovigerous female (holotype).

Description. – Carapace, measured from the base of the rostrum, little longer than broad. It is everywhere densely pubescent except for a bare spot on either side of the postgastric region and a second pair near the extremities of the anterior boundary of the cardiac region. There is a strong postantennal tooth which is nearly as large as the tooth at the anterolateral angle and separated from it by a nearly semicircular emargination. Behind and outside of the anterolateral tooth is a second one of nearly equal size, followed by a series of five denticles. At the end of the cervical groove, at the widest part of the carapace, is another well marked tooth and it is followed by two or three denticles. When the carapace is denuded, it is found that the dorsal surface bears a pair of sharp spines on the anterior gastric region and scattered tubercles and rugae which are most prominent and most numerous on the posterior branchial regions. The posterior margin is unarmed. Rostrum triangular with slightly sinuous margins, upturned at the end in lateral view and bluntly carinate in the dorsal midline.

Abdomen densely pubescent, like the carapace. It is unarmed, but the second, third and fourth somites have two blunt transverse ridges; the posterior one on the fourth somite is very low and scarcely discernible, however. The following somites are somewhat punctate and a little uneven.

The sternum is unarmed along the margins, sparsely hairy and with a few scattered granules.



FIG. 29

Munidopsis bermudezi. Holotype. × 1.

The eyestalks are immovable and are armed with a long stout distal spine, at the outer base of which is set the small, colorless cornea.

Basal segment of the antennular peduncle is swollen, practically unarmed save for an acute angle on the inner side of the insertion of the following joint and with two subequal spines on the outer side.

Third maxillipeds with each distal angle of the ischium ending in a sharp point and the merus armed with four spines, diminishing in size distally, on the inner margin and a small tooth at the outer distal angle.

Chelipeds short and stout, about as long as the carapace minus the rostrum, measured from the ischial fracture. They are covered with rather long hairs. The ischium has a dorsal and a ventral spine at the meral articulation; the merus has four spines at the carpal articulation and a longitudinal row of five spines on the upper surface; the chelae are short and broad and the spooned fingers are longer than the palm.

The ambulatory legs are strongly spinose on the meral, carpal and propodal joints except for the propodus of the third pair. The dactyls are armed with six or seven small spines on the lower margin.

There are epipods on the chelipeds, but not on any of the ambulatory legs, in this species.

The holotype has about 75 round, colorless eggs which measure about 2.5 mm. in diameter.

Measurements. – This is a relatively large species. The holotype has a total length of about 69 mm., the carapace and rostrum 37.7 mm. long and 27.0 mm. wide and the rostrum 10.2 mm. long. The paratype is slightly larger, the carapace and rostrum measuring 40.2 mm. in length.

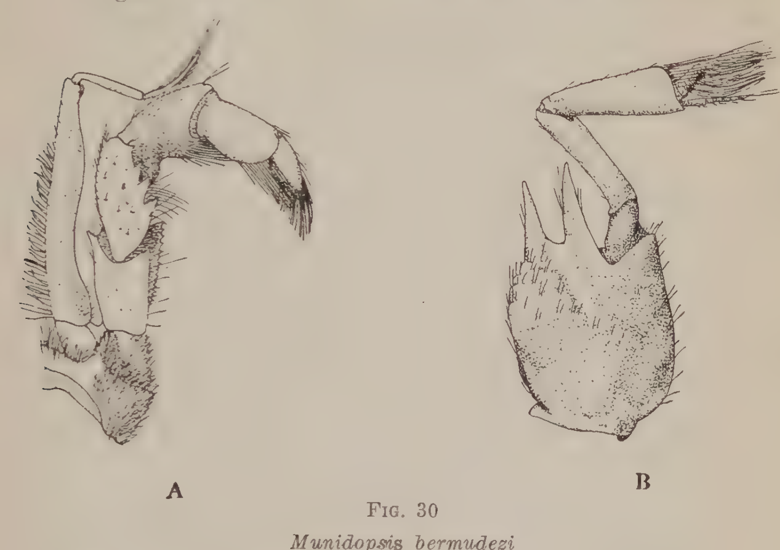


FIG. 30

Munidopsis bermudezi

Holotype. – A. Posterior view of right third maxilliped. × 5¼.
– B. Ventral view of right antennule. × 8.

Remarks. – This species is distinguished from all other species of the genus by the combination of the following characters: a single pair of gastric spines, immovable eyestalks, a single large ocular spine and small cornea. It resembles the figure of *M. ceratophthalma* Alcock from the Andaman Sea (Cat. Indian Deep-sea Crust., 1901, p. 271, pl. 3, fig. 2), but the lateral spine behind the posterior branch of the cervical groove is much larger in the "Atlantis" specimens and there are two spines on the gastric region which are lacking in Alcock's species.

MUNIDOPSIS SERRATIFRONS (A. Milne Edwards)

Galathodes serratifrons A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 55.

Munidopsis serratifrons Henderson, 1888, Rep. Sci. Res. H. M. S. Challenger. Zoology, vol. 27, (pt. 69), p. 149, pl. 16, fig. 3. Milne Edwards and Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 275. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 78, pl. 6, figs. 12-14. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, pp. 277, 326.

Occurrence.

North coast of Cuba:

Off Playa Baracoa, Havana Province; station 3,305; 330 fathoms; 1 male.

Off Bahia de Cárdenas, Matanzas Province; station 3,474; 490 fathoms; 1 male (variety); station 3,475; 400 fathoms; 1 young male.

Remarks.– The specimen from station 3,474 is quite abnormal. The carapace has a much more spinose appearance, many of the tubercles being raised to sharp spines, and the posterior margin is armed with eight, rather than two, sharp spines. The abdomen also is armored differently from the type and the other specimens examined; the posterior carinae of the second and third somites have only two spines, the median spine being absent, the median spine on the anterior carina of the third somite is bifid and the fourth somite is wholly unarmed. Although these characters are more striking than many of the differences between other species of the genus, I am strongly inclined to the belief that in this case they are merely the result of the abnormal development of an individual specimen.

Distribution. – Off Bermuda, off the north coast of Cuba and off Dominica in depths of 310 to 1,075 fathoms.

MUNIDOPSIS SPINOCULATA (A. Milne Edwards)

Orophorhynchus spinoculatus A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 59.

Munidopsis spinoculata Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 275. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 75, pl. 6, figs. 8-11. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 276.

Occurrence.

North coast of Cuba:

Off Bahia de Cárdenas, Matanzas Province; station 3,471; 500 fathoms; 1 ovigerous female.

Remarks. – This, the first specimen recorded since the male holotype, is slightly smaller than that specimen, the carapace and rostrum measuring about 10 mm. It agrees with the type, however, in nearly every particular, except that the carapace is slightly more convex along that portion of the lateral margin between the two branches of the cervical groove.

Distribution. – Previously known only from off Dominica in 824 fathoms.

MUNIDOPSIS TRIDENS (A. Milne Edwards)

Galathodes tridens A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 57. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 279. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 96, pl. 7, figs. 13-15, pl. 8, fig. 1.

Munidopsis tridens Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 328.

Occurrence.

North coast of Cuba:

Off Playa Baracoa, Havana Province; station 3,303; 260 fathoms; 1 ovigerous female.

Remarks. – Although this specimen is somewhat smaller than the type, the carapace and rostrum measuring 9.2 mm., it agrees with it in all essential characters. The only difference is to be found in the armature of the third maxillipeds, which is subject to some variation in this particular group; typically, the inner margin of the merus of that appendage is armed with two spines or teeth followed by a denticle, but in the "Atlantis" specimen these two teeth show a tendency to become fused and are almost completely so on the appendage on the left side.

Distribution. – Previously known only from the ovigerous female holotype taken off St. Kitts in 208 fathoms.

MUNIDOPSIS LATIFRONS (A. Milne Edwards)

Galathodes latifrons A .Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 57. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 279. Milne Edwards & Bouvier, 1897. Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 94, pl. 8, figs. 2, 3.

Munidopsis latrifrons Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 276.

Occurrence.

North coast of Cuba:

Off Bahia de Cárdenas, Matanzas Province; station 2,995; 370-605 fathoms; 3 males.

Remarks. – The unique type of this species is not to be found in the Museum of Comparative Zoölogy, so it has been impossible to check the identification of these specimens with complete certainty. There is little doubt, however, that they belong to this species, for at least one of the three specimens agrees in nearly every particular

with Milne Edwards' and Bouvier's description and figures. One of them differs from the type in having only two pairs of lateral spines on the carapace anterior to the cervical groove and this specimen also lacks spines on the anterior ridge of the second abdominal somite although, as in all three specimens, there is a distinct spine just above the lateral margin of the pleuron of that somite. The ambulatory legs, which were missing in the type, have the merus armed with four or five long spines on each margin and the carpus with about three similar spines on the upper edge; the lower margin of the dactyl is armed with about eight rather long movable spines. Benedict's key to the contrary, in these specimens the merus of the third maxillipeds usually has three spines on the inner margin, although the distal one may be much smaller than the other two.

Distribution. – Previously known only from the type female taken off Barbados in 399 fathoms.

MUNIDOPSIS TRIDENTATA (Esmark)

Galathea tridentata Esmark, 1857, Forh. skand. naturf., 7 mode, 1 (1856) p. 239. M. Sars, 1869, Forh. VidenskSelsk. Krist. (1868) p. 262. G. O. Sars, 1872, Forh. VidenskSelsk. Krist. (1871) pp. 256, 283.

Galathodes rosaceus A. Milne Edwards, 1881, C. R. Acad. Sci. Paris, vol. 93, p. 932. A. Milne Edwards, 1882, Arch. Miss. Sci. Litt., ser. 3, vol. 9, p. 40. A. Milne Edwards, 1883, Recueil de Figures de Crustacés nouveaux ou peu connus, pl. 15, figs. 1-1d.

Galathodes tridentata G. O. Sars, 1883, Forh. VidenskSelsk. Krist. (1882) no. 18, pp. 4, 43, pl. 1, fig. 3. G. O. Sars, 1890, Arch. Math. Naturv., bd. 13, p. 162, pl. 4. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 279, text-fig. 32. Norman, 1894, Ann. Mag. Nat. Hist., ser. 6, vol. 13, pp. 155, 159. Caullery, 1896, Rés. sci. Camp. "Caudan" Golfe de Gascogne, fasc. 2, p. 390. Milne Edwards & Bouvier 1899, Rés. Camp. sci. Monaco, fasc. 13, p. 83. Milne Edwards & Bouvier, 1900, Expéd. Sci. "Travailleur" et "Talisman", Crust. Déc., pt. 1, p. 331, pl. 31, figs. 5-7.

Munidopsis tridentata Ortmann, 1892, Zool. Jahrb., bd. 6, p. 256. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 276.

Munidopsis ? rosacea Alcock & Anderson, 1899, Ann. Mag. Nat. Hist., ser. 7, vol. 3, p. 19.

Munidopsis (*Galathodes*) *? tridentata* Alcock, 1901, Cat. Indian Deep-sea Crust., p. 264.

Munidopsis (*Galathodes*) *tridentata* Selbie, 1914, Fisheries Ireland, Sci. Invest., I, p. 81, pl. 12, figs. 1-5. Doflein & Balss, 1913, Wiss. Ergebn. deutsch. Tiefsee-Exped. (Valdivia), bd. 20, lf. 3, p. 158.

Occurrence.

North coast of Cuba:

Off Bahia de Cárdenas, Matanzas Province; station 2,995; 370-605 fathoms; 2 males, 3 females, 1 of which is ovigerous and 1 has a branchial parasite; station 2,996; 470-665 fathoms; 1 male with a branchial parasite, 1 female; station 3,472; 510 fathoms; 1 female; station 3,474; 490 fathoms; 1 male.

Remarks. – These specimens have been compared with a male of *M. tridentata* taken off Cape Bojador, West Africa, at "Talisman" station 7 and identified by Milne Edwards and Bouvier. Although several of the "Atlantis" specimens are in poor condition, all of them apparently agree in every particular with the eastern Atlantic form, except that the size of the denticle following the two long spines on the inner margin of the merus of the third maxillipeds is variable as it often is in other species of this group.

Distribution. – If all of the specimens on record are correctly assigned to this species, *M. tridentata* is one of the most widespread species in the genus. It has been found in the eastern Atlantic from off Norway (150-300 fathoms), off the coast of Ireland (627-893 fathoms), in the Bay of Biscay (656-809 fathoms), off the Azores (462-525 fathoms) and off the west coast of Africa and the Cape Verde Islands (324-665 fathoms); in the western Atlantic off the north coast of Cuba (490-510 fathoms); and in the Indian Ocean (210-679 fathoms).

MUNIDOPSIS BAHAMENSIS Benedict

Munidopsis bahamensis Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 278, text-fig. 22.

A fine series of this species was taken by "Atlantis" in 1940 east of St. Augustine, Florida; 2 males and 1 female with an abdominal parasite were taken at station 3,780; 30° 27′ N., 79° 52′ W.; 250-265 fathoms; February 24, 1940, and 5 males and 1 ovigerous female at station 3,781; 30° 58′ N., 79° 34′ W.; 265-290 fathoms; February 24, 1940.

Distribution. – Known only from the area east of northern Florida in depths of 265 to 352 fathoms.

Munidopsis armata (A. Milne Edwards)

Elasmonotus armatus A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 61. Henderson, 1888, Rep. Sci. Res. H. M. S. Challenger. Zoology, vol. 27 (pt. 69), p. 159, pl. 19, fig. 5. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 282. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 104, pl. 8, figs. 11-14.

Munidopsis armata Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 276.

Occurrence.

North coast of Cuba:

Off Bahia de Cárdenas, Matanzas Province: station 2,995; 370-605 fathoms; 1 male, 2 females, 1 of which is ovigerous; station 2,996; 470-665 fathoms; 1 male, 1 ovigerous female.

Nicholas Channel off Bahia de Santa Clara; Santa Clara Province; 535 fathoms; 1 male.

Remarks.—There is an additional male specimen in the Museum of Comparative Zoölogy taken by the "Blake" in 1878-79 off Martinique in 502 fathoms at station 195. This specimen was identified by A. Milne Edwards but apparently was never recorded.

Distribution.—Off the north coast of Cuba, Culebra Island, Sombrero Island, St. Croix and Martinique, all in the West Indies, in depths of 390-625 fathoms.

Munidopsis erinacea (A. Milne Edwards)

Galathodes erinaceus A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 53.

Munidopsis erinacea Henderson, 1888, Rep. Sci. Res. H. M. S. Challenger. Zoology, vol. 27 (pt. 69), p. 149, pl. 16, fig. 4. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 275. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 67, pl. 7, figs. 9-12. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 277. Boone, 1927, Bull. Bingham Oceanogr. Coll., vol. 1, art. 2, p. 60.

Occurrence.

North coast of Cuba:

Off Playa Baracoa, Havana Province; station 3,305; 330 fathoms; 2 females, 1 of which is ovigerous and the other has abdominal parasites; station 3,306; 330 fathoms; 1 male.

Off Bahia de Cárdenas, Matanzas Province; station 2,995; 370-605 fathoms; 1 ovigerous female; station 3,472; 510 fathoms; 1 male; station 3,474; 490 fathoms; 1 ovigerous female; station 3,475; 400 fathoms; 1 male.

Nicholas Channel off Bahía de Santa Clara, Santa Clara Province; station 2,992; 555 fathoms; 1 male.

Nicholas Channel south of Cay Sal Bank; station 3,450; 390 fathoms; 1 male; station 3,451; 405 fathoms; 1 female.

Distribution. – North coast of Cuba; off St. Croix, Nevis, St. Lucia and St. Vincent in the Lesser Antilles; off British Honduras; and off Pernambuco, Brazil, in depths of 151 to 555 fathoms.

MUNIDOPSIS SPINIFER (A. Milne Edwards)

Galathodes spinifer A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 54.

Munidopsis spinifer Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 275. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 64, pl. 7, figs. 6-8. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 277.

Occurrence.

North coast of Cuba:

Off Playa Baracoa, Havana Province; station 3,302; 230 fathoms; 1 male, 1 female; station 3,303; 260 fathoms; 1 male.

Nicholas Channel south of Cay Sal Bank; station 2,987; 280-300 fathoms; 1 female with an abdominal parasite; station 3,445; 330 fathoms; 2 males, 1 female.

Off Caibarién, Santa Clara Province; station 3,425; 250 fathoms; 1 male; station 3,432; 250 fathoms; 1 male; station 3,435; 255 fathoms; 2 males.

Western end of Old Bahama Channel; station 2,984; 240-250 fathoms; 1 male, 1 female.

Old Bahama Channel off Punta Alegre, Camagüey Province; station 2,980B; 220-225 fathoms; 1 ovigerous female; station 2,981D; 190-230 fathoms; 1 ovigerous female.

Off Puerto Tánamo, Oriente Province; station 3,372; 300 fathoms; 1 male.

Remarks. – Contrary to Milne Edwards' and Bouvier's statement, there is a spine on the frontal margin behind the base of the antenna in this species. The spines on the posterior margin number from four to six; the second and third abdominal somites apparently constantly

have five spines, but the fourth somite may have one, three or five; and rarely there is a small fourth spine on the inner margin of the merus of the third maxillipeds. In addition to the stations listed by Milne Edwards and Bouvier, this species was obtained by the "Blake" off Martinique in 170 fathoms at station 206, off St. Lucia in 151 fathoms at station 219 and off Barbados in 200 fathoms at station 291.

Distribution. – Off the north coast of Cuba and the Lesser Antilles from St. Kitts to Barbados in depths of 151 to 330 fathoms.

Munidopsis simplex (A. Milne Edwards)

Galathodes simplex A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 56.

Munidopsis simplex Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 275. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zool. Harv., vol. 19, no. 2, p. 89, pl. 5, figs. 2-7. Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 277.

Occurrence.

North coast of Cuba:

Northeast of Bahia de Nuevitas, Camagüey Province; station 3,379; 910 fathoms; 1 female.

Off Punta Lucrecia, Oriente Province; station 2,975; 1,015 fathoms; 1 male.

North of Baracoa, Oriente Province; station 3,357; 875 fathoms; 1 female; station 3,359; 1,000 fathoms; 1 male.

Remarks. – This species is very near *M. curvirostra* Whiteaves from the northern part of the North Atlantic, as has been pointed out by other authors. In *M. simplex*, the armature of the dorsal surface of the carapace, basal segment of the antennular peduncle and third maxillipeds is variable, but it is usually stronger than in *M. curvirostra*. In the specimens of each species at my disposal, the rostrum varies from 41 to 53 per cent of the remainder of the carapace in *M. simplex*, and in *M. curvirostra* from 71 to 76 per cent; it is always much more strongly curved in the latter species. There is little doubt that the two species are distinct, but *M. simplex* might properly be reduced to subspecific rank.

Distribution. – The north coast of Cuba and Lesser Antilles from Guadeloupe to St. Vincent in depth of 333 to 1,015 fathoms.

Munidopsis riveroi Chace

(Figs. 31, 32)

Munidopsis riveroi Chace, 1939, Mem. Soc. Cubana Hist. Nat., vol. 13, no. 1, p. 48.

Occurrence.

North coast of Cuba:

Nicholas Channel off Punta Sagua la Grande, Santa Clara Province; station 2,989; 360 fathoms; 1 male, 1 ovigerous female (holotype and paratype, respectively).

Off Caibarién, Santa Clara Province; station 3,442; 335 fathoms; 1 ovigerous female.

Description. – Carapace, from the base of the rostrum, distinctly longer than broad. The dorsal surface is quite convex transversely and the regions are well areolated, with the raised portions coarsely tuberculate or scabrous and the depressed areas smooth and pubescent. Aside from a lobe on the frontal margin at the base of the antenna, which can hardly be called dentate, the carapace is totally unarmed both on the dorsal surface and on the margins. Rostrum deeply excavate dorsally, broad, with subparallel margins in its basal half, and sinuously drawn out to an acute apical point distally; the apex is slightly upturned, giving a sinuous appearance to the rostrum in lateral view.

Abdomen with two distinct transverse carinae on each of the second, third and fourth somites, and each of these carinae is armed with a low median tooth.

Sternum unarmed and quite smooth except for the usual intersegmental ridges.

Eyes practically unpigmented, movable and unarmed.

Basal segment of antennular peduncle swollen, armed internally with a few denticles and outside of the articulation with the following joint with two spines, the outer the more slender and placed obliquely above the other.

Third maxillipeds with two blunt teeth on the inner margin of the merus and a smaller tooth at the outer distal angle of that segment.

Chelipeds about two and one-half times as long as the carapace and rostrum. All of the joints are more or less scabrous and the merus is armed on the inner margin with three equidistant conical spines. The fingers are somewhat shorter than the palm, very obscurely spooned at the tip, and the movable one extends slightly beyond the fixed finger. The chelipeds are somewhat more slender in the females than in the male.

Ambulatory legs scabrous but unarmed on the meral and carpal joints and the merus is distinctly carinate dorsally; the propodus is smooth and pubescent; the dactyl is curved and armed ventrally with four strong teeth.

There are no epipods on the chelipeds or ambulatory legs.

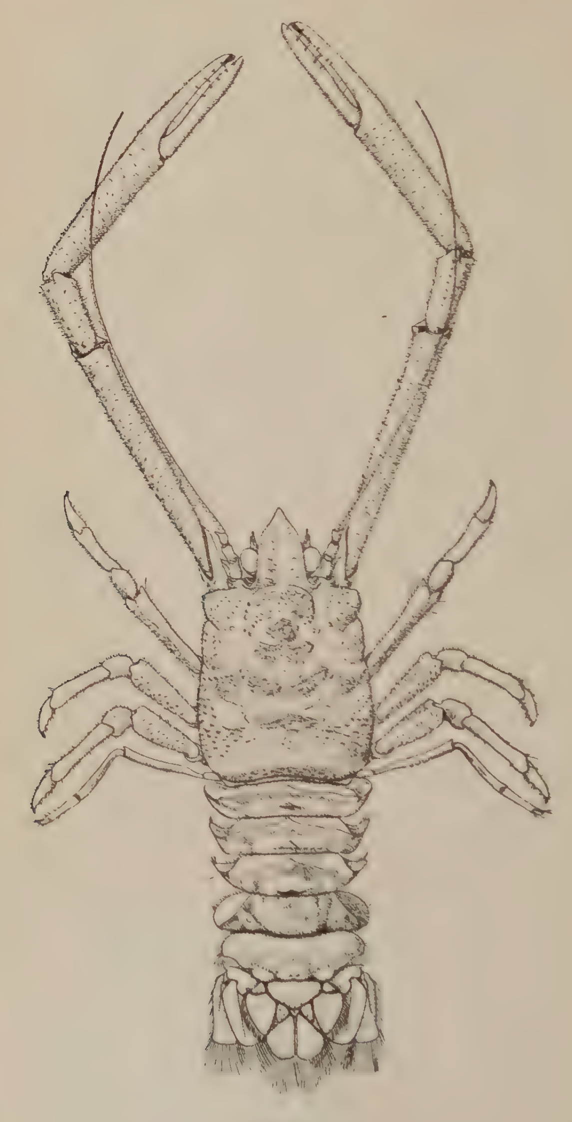


FIG. 31

Munidopsis riveroi. Holotype. × 2.

Measurements. – Total length of holotype from tip of rostrum to end of telson 36.3 mm.; length of carapace plus rostrum 17.8 mm.; length of rostrum 5.0 mm.; breadth of carapace 11.7 mm.; length of cheliped 46.2 mm. The ovigerous female paratype is slightly larger, having a carapace length to the base of the rostrum of 13.8 mm., and the other female is a little smaller, giving a similar measurement of 11.5 mm.

Remarks. – This species is quite distinct from those previously described. It shows the closest relationship to *M. longimana* and *M. brevimana*. From the first it is easily distinguished by the acuminate tip on the rostrum, and from both by the differently formed and much less produced second, third and fourth abdominal somites. The form of the basal segment of the antennular peduncle and the third maxillipeds is also different.

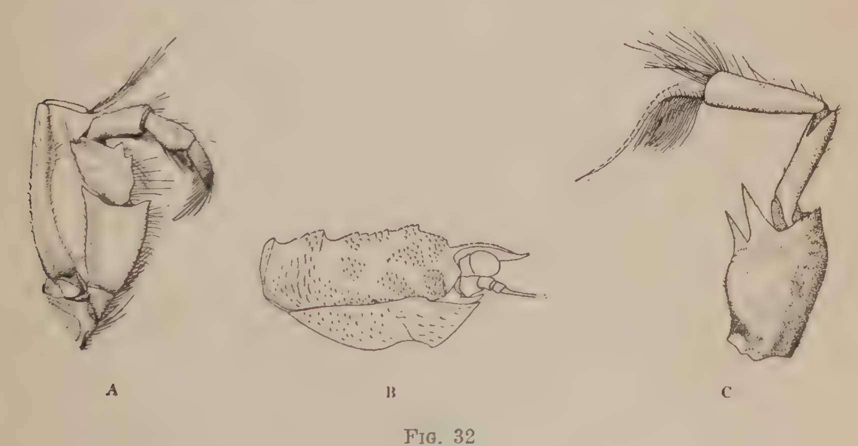


FIG. 32

Munidopsis riveroi

Holotype. – A. Posterior view of right third maxilliped. × 5. – B. Lateral view of carapace. × 2. – C. Ventral view of right antennule. × 7½.

MUNIDOPSIS LONGIMANA (A. Milne Edwards)

Elasmonotus longimanus A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 60. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 282. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 106, pl. 9, figs. 1-6.

Munidopsis longimana Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 277.

Occurrence.

North coast of Cuba:

Off Bahia de Cárdenas, Matanzas Province; station 2,995; 370-605 fathoms; 1 female with a branchial parasite; station 2,996; 470-665 fathoms; 1 female; station 3,471; 500 fathoms; 2 ovigerous females; station 3,472; 510 fathoms; 1 ovigerous female.

South coast of Cuba:

Off Banco Paz, south of Santa Clara Province; station 3,345; 690-700 fathoms; 1 ovigerous female.

Remarks. – All of these specimens except one, the female from station 2,996, can be separated without difficulty from *M. brevimana*. That specimen agrees with *M. longimana* in all characters except the carinate lobes on the second, third and fourth abdominal somites which are much broader and less prominent than in the typical *M. longimana*. These lobes show a tendency to become less prominent in females, however, and the form of the carapace and rostrum is characteristic of the species. Unfortunately the legs are missing from this specimen. For a discussion of the differences between this species and *M. brevimana*, see the remarks under that species.

Distribution. – From the north and south coasts of Cuba and off St. Croix, Dominica, Martinique and St. Lucia in the Lesser Antilles in depths of 372 to 690 fathoms.

Munidopsis brevimana (A. Milne Edwards)
(Fig. 33)

Elasmonotus brevimanus A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 60. Milne Edwards & Bouvier, 1894, Ann. Sci, nat., Zool., ser. 7, vol. 16, p. 282.

Occurrence.

North coast of Cuba:

Off Havana, Havana Province; station 3,003; 240-300 fathoms; 1 ovigerous female.

Off Caibarién, Santa Clara Province; station 3,435; 255 fathoms; 1 ovigerous female.

Remarks. – Since 1894, when Milne Edwards and Bouvier, without re-examining the type specimen, followed Faxon's suggestion that *M. brevimana* might be only the female of *M. longimana*, this species has dropped out of the literature and no mention of it is

made in recent lists of species. Comparison of the accompanying figure of the ovigerous female holotype of *M. brevimana* with Milne Edwards' and Bouvier's figure of *M. longimana* shows several differences between the two species, and examination of the "Blake" and "Atlantis" series in the Museum of Comparative Zoölogy reveals



FIG. 33

Munidopsis brevimana. Holotype. × 4.

that these differences are not entirely sexual. In *M. brevimana* the carapace is broader (despite Milne Edwards statement to the contrary) and the lateral margins are more convex, not subparallel as in *M. longimana;* the rostrum is slightly shorter and broader, less triang-

ular and less rounded at the tip, although in the two "Atlantis" specimens it is not drawn out to a sharp point as in the figured type; the carinate lobes on the second, third and fourth abdominal somites are not so narrowly and strongly produced outwards, although this character is somewhat variable; and the chelipeds are shorter and stouter. Since the two species appear to differ only in these characters of general form and agree in the armature of the basal segment of the antennular peduncle, third maxillipeds and ambulatory legs, there will probably be disagreement on the validity of *M. brevimana* until a sufficient number of specimens are available to settle the question beyond doubt. Since this species does have a distinctly different appearance from *M. longimana* and since the three known specimens were taken in lesser depths, it seems best to retain the name until it is possibly definitely demonstrated that the differences noted are entirely due to the action of environmental conditions on normal variation.

Distribution. – From off the north coast of Cuba and off Barbados in depths of 200 to 255 fathoms.

MUNIDOPSIS ABDOMINALIS (A. Milne Edwards)

Elasmonotus abdominalis A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 61. Milne Edwards & Bouvier, 1894, Ann. Sci. nat., Zool., ser. 7, vol. 16, p. 282. Milne Edwards & Bouvier, 1897, Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, p. 101, pl. 8, figs. 7-10.

Munidopsis abdominalis Benedict, 1902, Proc. U. S. Nat. Mus., vol. 26, no. 1311, p. 315.

Occurence.

North coast of Cuba:

South end of Santaren Channel, southeast of Cay Sal Bank; station 2,985; 250 fathoms; 1 male.

Old Bahama Channel off Punta Alegre, Camagüey Province; station 2,982C; 195-225 fathoms; 1 ovigerous female.

Old Bahama Channel off the western end of Cayo Romano, Camagüey Province; station 3,387; 245 fathoms; 1 male.

South coast of Cuba:

Bahia de Cochinos, Santa Clara Province; station 2,961D; 195-235 fathoms; 1 male.

Remarks. – These specimens agree almost perfectly with the cotype from "Blake" station 291 in the Museum of Comparative Zoölogy. A third specimen, a male apparently not seen by Milne Edwards

or Bouvier, was taken by the "Blake" off St. Kitts at station 148 in 208 fathoms.

Distribution.—Off the coasts of Cuba and off St. Kitts and Barbados in the Lesser Antilles in depths of 200 to 250 fathoms.

Family PORCELLANIDAE

As practically all of the members of this family are littoral or sublittoral in habitat, it is not surprising that only one species is represented in the "Atlantis" collections.

In a family containing shallow-water forms for the most part, it is regrettable that its systematics are so poorly known. It was originally planned to include in this report keys to all western Atlantic species, but it soon became apparent that this would entail a revision of the entire family. Such a task, imperative though it is, would require more time and material than is at my disposal at present.

Even the key to the genera, given below, should be treated more as an incentive toward a more detailed study of the family than as a certain guide to the generic determination of all species. As in the genus *Munidopsis*, discussed above, there are so many intermediate species between the generally recognized genera that no key can be trusted implicitly. Even though the genera so far known are difficult of exact determination, it is my belief that several additional genera or subgenera will have to be erected eventually to take care of certain aberrant forms. *Petrolisthes*, as at present defined, is far from a homogeneous group and could probably be handled much more simply if split up into three or more groups. Two or three species of *Porcellana* are also quite distinct from the typical forms.

It has been my good fortune to have been able to study, from material in the Museum of Comparative Zoölogy, examples of all but two of the recognized genera. The first of these, *Ulloaia*, is so distinct and has been so well described and figured by Glassell that there is little difficulty in separating it from other genera. The other, however, *Porcellanides*, is totally unknown to me, and as I have not even seen Czerniawsky's description, it has unfortunately been omitted from the key.

Some time ago Mr. S. A. Glassell very kindly sent me specimens of *Porcellanopsis festae* (Nobili) with the remarks that this species is not biunguiculate as described by Nobili. Despite the absence of this distinguishing character, I am of the opinion that it may best be considered the type of a distinct group to which could be added

Say's *Porcellana soriata* from the western Atlantic and Lockington's *Pachycheles tuberculipes* from the west coast of Central America. Mr. Glassell has written me that the latter species probably belonged in *Porcellana* and not in *Pisonella*, where he had placed it[1], and he has also expressed some doubt as to whether *Pisonella* should be distinguished from *Megalobrachium*. Comparison of the genotype of that species, *P. sinuimanus* (Lockington), received from Mr. Glassell, with *Megalobrachium poeyi* (Guerin), leaves little doubt in my mind that the species are congeneric and, although I have not seen *Pisonella smithi* (Glassell) or *P. erosa* (Glassell), it seems probable that they, too, can best be accomodated in *Megalobrachium*. I wish to take this opportunity to express my gratitude to Mr. Glassell for allowing me to suggest these revisions here, so that the generic key may contain one or two fewer misleading statements.

Of the fifteen genera here recognized (*Porcellanides* Czerniawsky, 1884, included), eight have so far been recorded from the western Atlantic. These are: *Pachycheles*, *Petrolisthes*, *Pisosoma*, *Minyocerus*, *Porcellana*, *Porcellanopsis*, *Megalobrachium* and *Polyonyx*.

KEY TO THE GENERA OF THE FAMILY PORCELLANIDAE

1. Form elongate, ''hippa''-like; telson much longer than broad; movable portion of antenna removed from orbit by prolongation of basal segment, but frequently obscurely so; size small to medium.......... ....*Euceramus* Stimpson, 1860.
   Form less elongate; telson usually broader than long, never much longer than broad 2
2. Chelipeds long and subcylindrical, held more or less straight out in front of body; lateral margin of carapace armed with 10-15 very small, forwardly curved spines; movable segments of antenna very narrowly separated from orbit; size very small..................... ....*Orthochela* Glassell, 1936.
   Chelipeds rarely subcylindrical, usually bent sharply at the carpo-propodal articulation 3
3. Epimeral piece (lateral wall of carapace) broken up into several parts, separated by membranous interspaces; carapace more or less subquadrate; chelipeds very robust, thick and rough; movable segments of antenna very narrowly separated from orbit; size medium....... .... *Pachycheles* Stimpson, 1859.
   Epimeral piece nearly always entire, if not the movable segments of the antenna are not narrowly separated from orbit................ 4
4. Basal antennal segment small, not joining margin of carapace, so that movable segments have free access to orbit......................... 5

(1) Glassell, 1938, Trans. San Diego Soc. Nat. Hist., vol. 8, no. 33, p. 437.

Basal antennal segment strongly produced forward and broadly in contact with margin of carapace, so that movable portion is far removed from orbit 8

5. Front rather prominent in dorsal view, roughly triangular; chelipeds depressed and not heavily sculptured; size medium to large....... 6
Front not prominently triangular in dorsal view; carpus of chelipeds, at least, thick and heavily sculptured; size small.................. 7

6. Front not abnormally large; ambulatory legs usually armed, hairy or both ....*Petrolisthes* Stimpson, 1859.
Front an abnormally large, laminate structure; ambulatory legs subcylindrical and nude..................*Neopetrolisthes* Miyake, 1937.

7. Front either feebly convex or faintly trilobate in dorsal view; carapace nearly smooth ....*Pisosoma* Stimpson, 1859.
Front quadridentate in dorsal view; carapace grossly squamo-tuberculate ....*Ulloaia Glassell*, 1938.

8. Dactyls of ambulatory legs ending in a simple spine, with or without small, movable accessory spinules on lower margin................. 9
Dactyls of ambulatory legs armed with from two to four strong, fixed spines 13

9. Dactyls of ambulatory legs in form of a very long, slender spine, without accessory spinules of any sort; carapace much broader than long, laterally dentate; front strongly trilobate; size medium........... ....*Raphidopus* Stimpson, 1859.
Dactyls of ambulatory legs not unusually long and slender, usually provided with a row of movable spinules on lower margin.......... 10

10. Front strongly tridentate in dorsal view, carapace usually longer than broad; chelipeds not robust or grossly sculptured................ 11
Front trilobate or simply triangular in dorsal view; carapace usually broader than long; chelipeds thick and grossly sculptured.......... 12

11. Carapace elongate, about one-fourth longer than broad; a strong spine on lateral margin; size very small. ......*Minyocerus* Stimpson, 1859.
Carapace only slightly longer than broad; at most a spine-tipped lobe on lateral margin at epibranchial angle; size medium (rarely small) ....*Porcellana* Lamarck, 1801.

12. Front strongly tridentate in frontal view; chelipeds and carpus and propodus of ambulatory legs decorated with tuberculate or granular nodules; size small..................*Porcellanopsis* Rathbun, 1910.
Front feebly trilobate in frontal view; chelipeds and ambulatory legs not nodular, but chela, at least, is granular and longitudinally ridged. ....*Megalobrachium* Stimpson, 1859.

13. Carapace noticeably longer than broad; front strongly tridentate in dorsal view; size medium................*Porcellanella* White, 1852.
Carapace distinctly broader than long; front nearly transverse in dorsal view; size medium.....................*Polyonyx* Stimpson, 1859.

Porcellana sigsbeiana A. Milne Edwards

Porcellana sigsbeiana A. Milne Edwards, 1880, Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, p. 35. Benedict, 1901. Bull U. S. Fish Comm. for 1900, vol. 20, pt. 2, p. 137. Milne Edwards & Bouvier, 1923, Mem. Mus. Comp. Zoöl. Harv., vol. 47, no. 4, p. 292, pl. 1, fig. 6. Schmitt, 1935, Sci. Surv. Porto Rico and Virgin Ids. (N. Y. Acad. Sci.), vol. 15, pt. 2, pp 189, 190.

Occurrence.

North coast of Cuba:

Old Bahama Channel off Punta Alegre, Camagüey Province; station 3,413; 215 fathoms; 1 ovigerous female; station 3,418; 195 fathoms; 1 male, 1 ovigerous female.

Remarks. – These three specimens are somewhat larger than the types, each of them having a carapace length of slightly more than 11 mm. They agree with the "Blake" specimens in most particulars, but the lobe at the proximal end of the anterior margin of the carpus of the chelipeds is less prominent; in the specimens from station 3,418 it is very inconspicuous. These specimens were found in greater depths than any previously recorded.

Distribution. – From off Marthas Vineyard and North Carolina to the Gulf of Mexico and the Virgin Islands in depths of 27 to 215 fathoms.

LITERATURE CITED

Alcock, A.

1901. A Descriptive Catalogue of the Indian Deep-sea Crustacea Decapoda and Anomala in the Indian Museum. Calcutta, pp. 1-286, pls. 1-3.

Alcock, A. & Anderson, A. R. S.

1894. Natural History Notes from H. M. Indian Marine Survey Steamer "Investigator", etc. Series II, No. 14. An Account of a Recent Collection of Deep Sea Crustacea from the Bay of Bengal and Laccadive Sea. J. Asiat. Soc. Beng., vol. 63, pt. 2, no. 3, pp. 141-185, pl. 9.

1899 Natural History Notes from H. M. Royal Indian Marine Survey Ship "Investigator", etc. Series III, No. 2. An Account of the Deep-sea Crustacea dredged during the Surveying season of 1897-98. Ann. Mag. Nat. Hist., ser. 7, vol. 3, pp. 1-27.

Benedict, J. E.

1901. The Anomuran Collections Made by the Fish Hawk Expedition to Porto Rico. Bull. U. S. Fish Comm. for 1900, vol. 20, pt. 2, pp. 129-148, pls. 3-6.

1902. Descriptions of a New Genus and Forty-six New Species of Crustaceans of the Family Galatheidae, with a List of the Known Marine Species. Proc. U. S. Nat. Mus., vol. 26, no. 1311, pp. 243-344, text-figs. 1-47.

BOONE, L.

1927. Scientific Results of the First Oceanographic Expedition of the ''Pawnee'' 1925. Crustacea from Tropical East American Seas. Bull. Bingham Oceanogr. Coll., vol. 1, art. 2, pp. 1-147, text-figs. 1-33.

BOUVIER, E. L.

1896. Sur la Famille des *Chirostylidae*, Ortmann, et sur la classification des *Galatheidea*. Bull. Soc. entom. France, vol. 65, pp.307-312.

1922. Observations complémentaires sur les Crustacés décapodes (Abstraction faite des Carides, provenant des Campagnes de S. A. S. le Prince de Monaco. Rés. Camp. sci. Monaco, fasc. 62, pp. 3-106, pls. 1-6.

CAULLERY, M.

1896. Crustacés Schizopodes et Décapodes, in: Rés. Camp. sci. ''Caudan'' Golfe de Gascogne, fasc. 2, pp. 365-419, pls. 13-17.

CHACE, F. A., JR.

1939. Reports on the Scientific Results of the first Atlantis Expedition to the West Indies, etc. Preliminary Descriptions of One New Genus and Seventeen New Species of Decapod and Stomatopod Crustacea. Mem. Soc. Cubana Hist. Nat., vol. 13, no. 1, pp. 31-54.

1940. Reports on the scientific results of the Atlantis expeditions to the West Indies, etc. The Brachyuran Crabs. Torreia (Havana), no. 4, pp. 3-67, text-figs. 1-22.

1940. The Atlantis expeditions to the West Indies in 1938 and 1939, etc. List of Stations. Printed for the Woods Hole Oceanographic Institution, pp. 1-8, 2 maps.

DAM, A. J. VAN

1933. Die Decapoden der Siboga-Expedition. VIII. Galatheidea: Chirostylidae: Siboga-Exped., livr. 119, monogr. 39a7, pp. 1-46, text-figs. 1-50.

DEICHMANN, E.

1936. Deports on the Scientific Results of the ''Blake'', etc. XLIX. The Alcyonaria of the Western Part of the Atlantic Ocean. Mem. Mus. Comp. Zoöl. Harv., vol. 53, pp. 1-317, pls. 1-37.

DOFLEIN, F. & BALSS, H.

1913. Die Galatheiden der Deutschen Tiefsee-Expedition. Wiss. Ergebn. deutsch. Tiefsee-Exped. (Valdivia), bd. 20, lf. 3, pp. 125-184 (1-60), text-figs. 1-24, pls. 12-17.

ESMARK

1857. Om Galathea tridentata. Forh. skand. naturf., 7 mode, 1, (1856), pp. 239-240.

FAXON, W.

1895. Reports on an Exploration off the West Coasts of Mexico, Central and South America, and off the Galapagos Islands, etc. XV. The Stalk eyed Crustacea. Mem. Mus. Comp. Zoöl. Harv., vol. 18, pp. 1-292, pls. A-K, 1-56.

FILHOL, H.

1885. La Vie au Fond des Mers. Paris, pp. 1-301, text-figs. 1-96, pls. 1-8.

GLASSELL, S. A.

1938. New and Obscure Crustacea from the West American Coasts. Trans. San Diego Soc. Nat. Hist., vol. 8, no. 33, pp. 411-454, pls. 27-36.

GORDON, I.

1930. On the Species of the Galatheid Genus, *Eumunida* (Crustacea, Decapoda). Proc. Zool. Soc. Lond., (1929), pt. 4, pp. 741-754, text-figs. 1-12.

HANSEN, H. J.

1908. Crustacea Malacostraca. I. Danish Ingolf-Exped., vol. 3, pt. 2, pp. 1-120, pls. 1-5.

HAY, W. P. & SHORE, C. A.

1918. The Decapod Crustaceans of Beaufort, N. C., and the Surrounding Region. Bull. U. S. Bur. Fish., vol. 35, pp. 371-475, text-figs. 1-20, pls. 25-39.

HENDERSON, J. R.

1885. Diagnoses of the new Species of *Galatheidea* collected during the "Challenger" Expedition. Ann. Mag. Nat. Hist., ser. 5, vol. 16, no. 96, pp. 407-421.

1888. Report on the Anomura collected by H. M. S. Challenger during the Years 1873-76. Rep. Sci. Res. H. M. S. Challenger. Zoology, vol. 27 (pt. 69) pp. ii-xi, 1-221, pls. 1-21.

ILLUSTRATIONS of the Zoology of H. M. Indian Marine Surveying Steamer Investigator. Crustacea. Calcutta. 1892-1907, pls. 1-79.

MILNE EDWARDS, A.

1880. Reports on the Results of Dredging under the Supervision of Alexander Agassiz, in the Gulf of Mexico, and in the Caribbean Sea, etc. VIII. Études préliminaires sur les Crustacés. Bull. Mus. Comp. Zoöl. Harv., vol. 8, no. 1, pp. 1-68, pls. 1-2.

1881. Compte rendu sommaire d'une exploration zoologique faite dans l'Atlantique, à bord du navire le Travailleur. C. R. Acad. Sci. Paris, vol. 93, pp. 931-936.

1882. Rapport sur la Faune Sous-Marine dans les Grandes Profondeurs de la Mediterranée et de l'Ocean Atlantique. Arch. Miss. Sci. Litt., ser. 3, vol. 9, pp. 5-63, 2 maps.

1883. Recueil de Figures de Crustacés nouveaux ou peu connus, pls. 1-44.

1891. Miss. Sci. Cap. Horn, Crust., pp. F1-F76, pls. 1-8a.

MILNE EDWARDS, A. & BOUVIER, E. L.
1894. Considérations générales sur la Famille des Galathéidés. Ann. Sci. nat., Zool., ser. 7, vol. 16, pp. 191-327, text-figs. 1-36.
1894. Crustacés décapodes provenant des campagnes du yacht l'Hirondelle (1886, 1887, 1888). I. Brachyures et Anomoures. Rés. Camp. sci. Monaco, fasc. 7, pp. 3-112, pls. 1-11.
1897. Reports on the Results of Dredging, under the Supervision of Alexander Agassiz, in the Gulf of Mexico (1877-78), in the Caribbean Sea 1878-79) and along the Atlantic Coast of the United States (1880), etc. XXXV. Description des Crustacés de la Famille des Galathéidés recueillis pendant l'Expédition. Mem. Mus. Comp. Zoöl. Harv., vol. 19, no. 2, pp. 1-141, pls. 1-12.
1899. Crustacés Décapodes provenant des campagnes de l'Hirondelle (supplement) et de la Princess-Alice (1891-1897). Rés. Camp. sci. Monaco, fasc. 13, pp. 3-106, pls. 1-4.
1900. Expéd. Sci. ''Travailleur'' et ''Talisman'', Crust. Déc., pt. 1, pp. 1-396, pls. 1-32.
1923. Reports on the Results of Dredging, under the Supervision of Alexander Agassiz, in the Gulf of Mexico (1877-78), in the Caribbean Sea (1878-79) and along the Atlantic Coast of the United States (1880), etc. XLVII. Les Porcellanides et des Brachyures. Mem. Mus. Comp. Zoöl. Harv., vol. 47, no. 4, pp. 283-395, text-figs. 1-23, pls. 1-12.

NORMAN
1894. A Month on the Trondhjem Fiord. Ann. Mag. Nat. Hist., ser. 6, vol. 13, pp. 150-166.

ORTMANN, A.
1892. Die Decapoden-Krebse des Strassburger Museums. Zool. Jahrb., bd. 6, pp. 241-326, pls. 11-12.

PERRIER, E.
1886. Les Explorations Sous-Marines. Paris, Libraire Hachette et C., pp. 1-352, text-figs. 1-243.

SARS, G. O.
1872. Undersogelser over Hardanger-fjordens Fauna. Forh. VidenskSelsk. Krist. (1871) pp. 246-286.
1883. Oversigt af Norges Crustaceer med forelobige Bemaerkninger over de nye eller mindre bekjendte Arter. I. (Podophthalmata—Cumaca—Amphipoda). Forh. VidenskSelsk. Krist. (1882) no. 18, pp. 1-124, pls. 1-6.
1890. Bidrag til Kundskaben om Decapodernes Forvandlinger. II. Lithodes—Eupagurus—Spiropagurus—Galathodes—Galathea—Munida—Porcellana—(Nephrops). Arch. Math. Naturv., bd. 13, pp. 133-201, pls. 1-7.

SARS, M.
1869. Fortsatte Bemaerkninger over det dyriske Livs Ubbredning i Havets Dybder. Forh. VidenskSelsk. Krist. (1868) pp. 246-275.

SCHMITT, W. L.
1935. Crustacea Macrura and Anomura of Porto Rico and the Virgin Islands. Sci. Surv. Porto Rico and Virgin Ids. (N. Y. Acad. Sci.), vol. 15, pt. 2, pp. 125-227, text-figs. 1-80.

SELBIE, C. M.
1914. The Decapoda Reptantia of the Coasts of Ireland. Part I. Palinura, Astacura and Anomura (except Paguridea). Fisheries, Ireland, Sci. Invest., I, pp. 1-116, pls. 1-15.

SMITH, S. I.
1882. Reports on the Results of Dredging under the Supervision of Alexander Agassiz, on the East Coast of the United States, etc. XVII. Report on the Crustacea. Part. I. Decapoda. Bull. Mus. Comp. Zoöl. Harv., vol. 10, no. 1, pp. 1-108, pls. 1-16.
1883. Preliminary Report on the Brachyura and Anomura Dredged in Deep Water off the South Coast of New England by the United States Fish Commission in 1880, 1881, and 1882. Proc. U. S. Nat. Mus., vol. 6, no. 1, pp. 1-57, pls. 1-6.
1884. Report on the Decapod Crustacea of the Albatross Dredgings off the East Coast of the United States in 1883. Rep. U. S. Comm. Fish. for 1882, pp. 345-426, pls. 1-10.
1885. On Some New or Little Known Decapod Crustacea, from Recent Fish Commission Dredging off the East Coast of the United States. Proc. U. S. Nat. Mus., vol. 7, no. 32, pp. 493-511.
1886. Report on the Decapod Crustacea of the Albatross Dredgings off the East Coast of the United States During the Summer and Autumn of 1884. Rep. U. S. Comm. Fish. for 1885, pt. 13, no. 21, pp. 605-705, pls. 1-20.

STEBBING, T. R. R.
1902. South African Crustacea. Part. II. Cape Town, pp. 1-92, pls. 5-16.
1908. Marine Investigations in South Africa. Vol. 6. Part. 1. South African Crustacea, Part. IV. Ann. S. Afr. Mus., vol. 6, pp. 1-96, pls. 27-40.

VERRILL, A. E.
1908. Decapod Crustacea of Bermuda I. Brachyura and Anomura. Trans. Conn. Acad. Arts. Sci., vol. 13, pp. 299-474, text-figs. 1-67, pls. 9-28.

WOOD-MASON, J. & ALCÓCK, A.
1891. Natural History Notes from H. M. Indian Marine Survey Steamer "Investigator", etc. No. 21. Note on the Results of the last Season's Deep-sea Dredging. Ann. Mag. Nat. Hist., ser. 6, vol. 7, pp. 186-202, text-fig. 4.